SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 SCOPE

A. This Specification Section covers the following:

1. The earthwork for, or related to, the following:

a. Excavation of materials from various areas of the site, including the following:

1) Removal of windblown contaminated materials.

2) Removal of contaminated materials from the tailings pile and the foundation of the Crusher Building.

3) Construction of wastewater retention basin.

4) Construction of drainage ditches.

5) Construction of access control and parking areas.

6) Finish grading of the site.

7) Construction of tailings embankment foundation.

8) Vicinity properties (contaminated) material being stockpiled by others.

b. Fill with materials including the following:

1) Construction of tailings embankment.

2) Construction of wastewater retention basin and Brown's Wash dike.

3) Construction of drainage ditches.

4) Construction of access control and parking areas.

5) Finish grading of the site.

2. Disposal of contaminated and uncontaminated demolished materials and debris resulting from work specified in Sections 02051, 02090 and 02110 in the construction of the tailings embankment.

1.2 WORK NOT INCLUDED

A. Earthwork related to the construction of offsite construction facilities specified in Section 01500 is not included in this Section.

B. Earthwork for pipe trenches is not included in this Section.

1.3 RELATED WORK

A. Section 00800 - Special Conditions: Definitions

B. Section 01300 - Submittals

C. Section 01500 - Construction Facilities

D. Section 02051 - Demolition and Decontamination

E. Section 02090 - Sealing Monitor Wells

F. Section 02110 - Site Clearing

G. Section 02141 - Dewatering and Drainage

H. Section 02278 - Erosion Protection

I. Section 02935 - Seeding

1.4 DEFINITIONS

A. Contaminated materials and uncontaminated materials are defined in Article SC-1 of the Special Conditions.

B. Excavation: Excavation shall include excavation of all materials encountered regardless of the nature of the materials, including topsoil, silt, clay, sand, gravel, talus, soft or disintegrated rock, boulders or detached pieces of solid rock that can be effectively loosened or broken down by ripping in a single pass with a late model tractor-mounted hydraulic ripper equipped with one digging point of standard manufacturer's design adequately sized

for use with and propelled by a crawler-type tractor rated between 210- and 240-net flywheel horsepower, operating in low gear, or where it is impracticable to classify by use of the ripper described above, the excavation can be defined as material that can be loosened or broken down by a 6-pound drifting pick. The drifting pick shall be Class D, Federal Specification GGG-H-506D, with handle not less than 34 inches in length. Excavation shall exclude rocks requiring drilling and blasting operations. Excavation shall be classified into the following categories:

1. Contaminated Materials Excavation.

2. Uncontaminated Materials Excavation.

C. Contaminated Materials Excavation: Contaminated materials excavation shall include excavation of contaminated materials from various areas of the site, including, but not limited to, the existing tailings pile, windblown areas, the wastewater retention basin, vicinity property stockpile, building foundations, access control and parking areas, southeast drainage ditch and Brown's Wash dike foundation.

D. Uncontaminated Materials Excavation: Uncontaminated materials excavation shall include excavations of uncontaminated materials from various areas of the site including, but not limited to, excavations for tailings embankment, drainage ditches, retention basin, access control and parking areas, trenches, and site grading.

E. Overexcavation: Overexcavation is defined as excavation carried out beyond the lines and grades indicated on the Subcontract Drawings or in the Subcontract Specifications.

F. Percent Maximum Density: Percent maximum density is a percentage of the maximum density obtained by the test procedure presented in ASTM D698.

G. Topsoil: Topsoil for use as seed bed shall be free of any admixture of subsoil, foreign matter, toxic substances, and any material or substance that may be harmful to plant growth.

H. Tailings Embankment: See Section 00800, Article SC-1

I. Subgrade Preparation: Subgrade preparation includes fine grading and compaction of soils in excavations including drainage ditches, backfills, embankments, and areas upon which bedding materials, riprap, aggregate base courses, or other features are to be constructed.

J. Cover: Cover shall consist of the layers of following fill materials placed over the relocated contaminated materials in the tailings embankment as shown on the Subcontract Drawings:

1. Radon barrier material.

2. Bedding material.

[Text Deleted]*

[3.]* Riprap material.

K. Vicinity Properties Materials: These are contaminated materials from areas other than the processing site. The materials shall include contaminated organic and inorganic soil, broken concrete, bricks, asphalt concrete, tree stumps, wooden members, metal objects, pipes, miscellaneous drainage structures, and the like.

L. Finish grading of the site shall include excavation, fill and backfill of the various areas of the site including, but not limited to, backfilling of retention basin, trimming and shaping of retention basin dikes, removal of Brown's Wash dike, temporary drainage ditches, sumps, and temporary facilities areas as shown on the Subcontract Drawings.

M. Common Uncontaminated Material Fill: See Part 2 of this Section.

N. Select Uncontaminated Material Fill: See Part 2 of this Section.

1.5 APPLICABLE PUBLICATIONS

A. The Publications listed below form a part of this Specification to the extent referenced. The Publications are referred to in the text by the basic designation only:

1. American Society for Testing and Materials (ASTM):

D422-63	Test Method for Particle-Size Analysis of Soils
D698-78	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. (2.49-kg) Rammer and 12-in. (305-mm) Drop

* P.I.D. 10-S-03, Rev. 3

D1556-82 Test Method for Density of Soil in Place by the Sand-Cone Method

D2167-84 Test Method for Density and Unit Weight of Soil In-Place by the Rubber-Balloon Method

D2216-80 Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures

D2922-81 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D3017-78 Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

[D4643-87 Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method]*

2. U.S. Federal Specifications:

GGG-H-506D Hoe, Mattock, and Pick

1.6 QUALITY ASSURANCE

A. The Contractor will take soil samples and perform moisture-density tests to ascertain that the work is being performed in compliance with these Specifications. Samples may be taken on the fill itself. The Contractor will conduct the density and other tests on the fill and related laboratory testing as specified in Article 3.6. The Subcontractor shall remove surface material and render assistance as necessary to enable sampling and testing.

B. Methods of Sampling and Testing:

1. In-Place Density: ASTM D1556, D2167, or D2922

2. Moisture Content: ASTM D2216, D3017[,or D4643]*

3. Laboratory Moisture-Density Relations: ASTM D698

4. Gradation: ASTM D422

* P.I.D. 10-S-03, Rev. 3

C. Suitability of Materials: The suitability of all materials for foundations and backfill will be determined by the Contractor in accordance with the requirements specified in this Section. Fill material shall be approved material from borrow areas or required excavations.

D. The Contractor may direct that inspection trenches or test pits be cut into fills to determine that the Specifications have been met. Such trenches or pits will be of limited depth and size, and shall be backfilled with the material excavated therefrom, or other fill material meeting the requirements for the zones cut into. Backfill shall be compacted to a density at least equal to that specified for adjacent fills.

E. When the Contractor directs inspection trenches or test pits to be excavated into fills and backfills and materials are found to meet all Specification requirements, the excavation and refilling shall be paid for as additional work pursuant to the applicable provisions of the General Conditions. Inspection trenches or test pits, and the refilling of the same, shall be at the Subcontractor's expense when it is found that the materials do not meet the Specification requirements.

F. Tolerances: See Specification Section 01052, Article 1.6.

1.7 SUBMITTALS

General submittal requirements are specified in Section 01300.

1.8 PROTECTION

A. The Subcontractor shall protect the following:

1. Trees, shrubs and other features remaining as a portion of final grading.

2. Bench marks and monuments, existing structures, fences, walks, pavings, curbs, etc. from equipment and vehicular traffic.

3. Utilities not specified for removal.

4. Excavations from cave-in by shoring, bracing, sheetpiling, underpinning or by other methods.

5. Bottoms of excavations and soil adjacent to and beneath structure foundations from frost.

6. Perimeters of excavations to prevent surface water runoff into excavation.

7. Monitor wells not to be sealed.

8. Existing structures and facilities not to be demolished.

PART 2 - PRODUCTS

2.1 UNCONTAMINATED FILL MATERIALS

A. General:

1. Uncontaminated fill material shall further be divided into the following categories:

   a. Common (General) Fill

   b. Select Fill, Type A

   c. Select Fill, Type B

   d. Radon Barrier Fill

   e. Gravel Fill

2. Common fill and select fill materials shall be obtained from required excavations to the extent available. Where the excavated materials do not meet the requirements of the Specifications or they are not available, the materials shall be furnished from Subcontractor's borrow areas, unless otherwise specified herein.

3. Radon barrier materials shall be obtained from the designated borrow areas. Gravel fill materials shall be furnished by the Subcontractor.

4. The Subcontractor shall make his own determination of any processing that may be required, and shall perform testing as required to ensure that the materials meet the Specification requirements, including materials from specified borrow areas.

5. Submittals for approval of sources proposed for use by the Subcontractor shall include boring logs, borrow area maps and supporting laboratory test data. The Subcontractor also shall provide evidence of availability, right of access to private property including access by the Contractor for sampling and testing, and his plan for hauling the materials to the site. Submittals for approval of sources for uncontaminated fill materials shall be received by the Contractor at least 30 days before use of the material at the site. The Contractor may perform additional tests to determine if the materials meet the requirements specified herein.

6. Approval will be based on evidence of compliance with the requirements specified herein and on verification by the Subcontractor that the volume of materials available is sufficient for construction requirements.

7. Common Fill:

   a. Common fill materials for top 6 inches of fill used in finish grading of the site shall be a mixture of available topsoil and generally fine grained excavated uncontaminated materials.

   b. Common fill to be used as fill or backfill below the top 6 inches of fill used in finish grading of the site shall have a maximum particle size not greater than the compacted lift thickness in any dimension, except as noted hereinafter. Individual large stones shall be distributed within the fill materials to provide visual void-free mass, and be able to meet the requirements of Article 3.8 or Article 3.5.D.10, as applicable.

8. Select Fill, Type A, Materials:

   a. Select fill, Type A, materials shall be soils excavated from the tailings embankment foundation area. It shall not contain more than 5 percent of combined particles larger than one-inch and excavated bedrock particles, as determined by the Contractor.

   b. The Subcontractor shall be responsible to perform selective excavation and stockpiling to produce suitable select fill materials including avoiding mixing of otherwise suitable materials with gravel deposits and bedrock.

9. Select Fill, Type B, Materials: Select fill B materials shall be soils excavated from areas within the final site boundary. Select fill B materials shall not contain material from shale bedrock excavation.

B. Radon Barrier Materials: Radon barrier materials shall be obtained from borrow areas indicated on the Subcontract Drawings. The materials shall conform to the following requirements:

1. Radon barrier materials shall be free from organic matter or other deleterious substances.

2. Radon barrier materials shall consist of soils from the designated borrow source obtained from a minimum of 2 feet below the existing ground surface.

3. [Radon barrier materials placed in the first lift over contaminated materials will comprise soils with a minimum of 70 percent by weight passing a No. 200 sieve. Radon barrier materials placed in the remaining lifts shall comprise soils with a minimum of 50 percent by weight passing the No. 200 sieve. All radon barrier materials shall comprise soils with a maximum of 10 percent by weight retained on a No. 4 sieve. Testing for percentage passing or retained on specified sieves shall be according to ASTM D422.]*

4. Radon barrier materials shall be screened or otherwise processed to reduce clod sizes to 1 inch or smaller prior to mixing with bentonite and moisture conditioning.

5. Bentonite: Bentonite shall be untreated sodium bentonite, suitable for use in a variety of liquid or effluent conditions, ["Envirogel 200"]*, as manufactured by Wyo-Ben, Inc., Billings, Montana, or approved equal. Bentonite shall meet the requirements of Specification 13A of the American Petroleum Institute.

C. Gravel Fill Materials:

1. Gravel fill materials shall be obtained from borrow areas indicated on the Subcontract Drawings or from Subcontractor's own sources, as approved by the Contractor. The Subcontractor shall notify the Contractor 30 days prior to use of proposed materials from sources other than the borrow areas indicated on the Subcontract Drawings. Any such sources shall be made

* P.I.D. 10-S-03, Rev. 3

accessible to the Contractor for sampling or testing at least 30 days prior to use of the proposed materials.

2. Gravel fill materials shall conform to the following requirements:

   a. Particle sizes shall be reasonably well graded within the limits shown below when determined in accordance with ASTM D422:

Sieve Size or Sieve No.	Percentage by Weight Passing Specified Sieve Size or No.
6-inch	100
3/8-inch	20-80
No. 4	10-50
No. 200	0-25

   b. Gravel fill materials shall be obtained from natural sand and gravel deposits with less than 5 percent by volume of deleterious materials, including clay lumps, friable particles, and organic matter.

2.2 CONTAMINATED FILL MATERIALS

Contaminated materials defined in Article SC-1 of the Special Conditions resulting from the clearing, stripping and excavation operations in contaminated areas. These materials shall include materials excavated from tailings pile, windblown areas, contaminated sediments from drainage ditches and wastewater retention basin, sump, and materials from underneath the floor slabs of contaminated structures.

2.3 DEMOLISHED MATERIALS AND DEBRIS

A. Contaminated and uncontaminated demolished materials and debris: Section 02051.

B. Contaminated Cleared Materials: Section 02110.

2.4 VICINITY PROPERTIES MATERIALS

See Article 1.4 K

2.5 EQUIPMENT

A. Vibratory rollers specified for compaction of gravel fill in Article 3.5.D.7 shall have a total static weight of not less than 20,000 pounds with at least 90 percent of the weight transmitted to the ground through a single smooth steel drum when the roller is in a level position. The diameter of the drums shall be a minimum of five feet and a maximum of five feet and six inches, and the width shall be a minimum of six feet and be equipped with suitable cleaning devices to keep them free of any accumulation of material. The frequency of vibration during operation shall be between 18 cps and 25 cps and the dynamic force applied by the roller shall be not less than 40,000 pounds at the operating frequency. The roller shall be self-propelled or suitable for towing by a crawler tractor with a minimum drawbar rating of 50 horsepower at speeds not exceeding three miles per hour. A Koehring/Bomag Model BW10S Vibratory Roller (tractortowed), or approved towed or self-propelled equal shall be used. Prior to the use of a vibratory roller in the work, the Subcontractor shall furnish manufacturer's data, drawings, and computations to verify compliance with the above specifications for approval by the Contractor.

B. Mixer: The mixer for mixing bentonite with the radon barrier material shall be capable of thoroughly mixing and controlling the percentage, by weight, of bentonite, soil, and water. The mixer shall be one of the following, or approved equal:

1. Self-propelled road mixer, Seaman TO-730H.

2. Portable pug-mill.

3. Portable drum roll asphalt plant, Cedarapids 4820 (with continuous flow process).

[4. A Caterpillar SS 250 rototiller-type mixer.]*

[C. Equipment for spreading bentonite on the ground, if used, shall be capable of uniformly spreading the specified amount of bentonite in one or two passes, where the second pass may be made transverse to the first pass. Equipment for spreading bentonite will be subject to Contractor's approval.

D. All equipment for spreading and mixing bentonite, and for moisture conditioning radon barrier materials mixed with bentonite, will be subject to approval by the Contractor.

* P.I.D. 10-S-03, Rev. 3

E. Compaction equipment for contaminated materials shall be a smooth-drum vibratory roller manufactured for the purpose of soil compaction. The minimum static weight of the roller drum shall be 160 pounds per lineal inch of drum width. The minimum centrifugal force applied to the roller drum at the operating frequency shall be 475 pounds per lineal inch of drum width. Operating frequency of the vibratory system shall be 1500 to 1800 vibrations per minute. The drum diameter shall be 58-62 inches. The roller shall be capable of operating at speeds of 2-3 miles per hour. The drum shall be equipped with a suitable cleaning device to keep it free of any accumulation of material. Roller used shall be BOMAG Model BW 213D, Caterpillar Model CS-553, or approved equal. Prior to the use of the vibratory roller in the work, the Subcontractor shall obtain approval from the Contractor. The Subcontractor shall furnish equipment manufacturer's data, drawings, specifications, and computations to the Contractor to verify compliance with the above specifications.]*

PART 3 - EXECUTION

3.1 PROTECTION OF EXPOSED SURFACES [AND SLOPES]*

A. During seasonal shutdowns and during other periods of prolonged exposure (more than six weeks) of excavated or filled areas, the Subcontractor shall provide labor, materials and equipment, as required by the Contractor, to maintain and protect exposed surfaces of uncontaminated and contaminated materials against wind erosion and excessive stormwater erosion. Prior to the application of protective erosion control measures, the exposed surfaces shall be sloped to drain and compacted with a tracked vehicle up and down the slope to eliminate ruts and ridges formed by construction equipment. Unless otherwise approved by the Contractor, acceptable methods of erosion protection are as follows:

1. Spraying with Water containing Chemical Additives: Acceptable chemical additive is "Soil Seal Concentrate" as manufactured by Soil Stabilization Products Company of Merced, California, or approved equal. Mixing and application shall be in accordance with the manufacturer's recommendations, or

2. Covering exposed surfaces with geotextile fabric such as "Supac" as manufactured by Phillips Fibers Corporation of San Jose, California, or approved equal. Handling and installation shall be as recommended by the manufacturer of the product.

* P.I.D. 10-S-03, Rev. 3

[B. Contaminated Materials: Contaminated material stockpiles shall be maintained to prevent ponding of stormwater and to promote stormwater runoff, to the maximum practical extent.]*

3.2 EARTHWORK - GENERAL

A. Preparation:

1. Required lines, levels, contours and datum shall be identified before the start of earthwork operations.

2. The Subcontractor shall verify the existing aboveground and underground utilities, identify them, and notify the Contractor immediately of his finding, if any, for appropriate action.

B. Dewatering and Drainage: Prior to commencement of earthwork operations, the Subcontractor shall verify that the dewatering and drainage facilities are constructed and operational in accordance with the requirements of Section 02141.

C. In order to avoid cross-contamination of uncontaminated material, the contaminated and uncontaminated materials shall be kept separated during earthwork operations. Stockpiles of contaminated materials shall be placed on contaminated areas and the drainage collected in the retention basin.

D. Earthwork shall conform to lines and grades indicated on the Subcontract Drawings or specified in this Section.

E. The excavated uncontaminated materials shall be used as fill in various areas of the sites including the construction of dikes, general fill, roadway fill, structure fill, backfill, and fill for the final grading of the sites, as required. Uncontaminated excavated material may be stockpiled for later use.

F. Temporary drainage ditches shall be constructed and maintained to provide drainage during construction.

G. Borrow area excavation, and restoration if required, shall conform to the requirements of the authority having jurisdiction over such areas.

* P.I.D. 10-S-03, Rev. 3

[H. Moisture Addition to Contaminated Materials:

1. Moisture shall only be added to contaminated materials for environmental dust control requirements. The Subcontractor shall use special measures such as fine spray nozzles to add moisture to contaminated materials, as approved by the Contractor, to minimize the amount of moisture added for dust control. The Subcontractor shall perform his operations to minimize the need for moisture addition to the extent practicable. Moisture addition shall not be permitted for the convenience of the Subcontractor. Water from the wastewater retention basin may only be used for dust control in contaminated excavation areas and on contaminated haul roads.

2. Dust control moisture shall be added to fill materials at the place of excavation preceding placement of fill materials in the tailings embankment. Moisture shall not be added in the tailings embankment area except when it is determined to be absolutely necessary for environmental dust control. At no time shall contaminated water be used in the tailings embankment.]*

3.3 EXCAVATION

A. General:

1. Excavation shall be carried out to reach the lines and grades indicated on the Subcontract Drawings or specified herein, or, in the case of contaminated materials, as required by the Contractor's Health Physics Personnel.

2. At all times, the Subcontractor shall conduct his operations in such a manner as to prevent free standing water and contamination of uncontaminated materials. The Subcontractor shall, as a minimum, take the following measures to safeguard against such problems:

a. Water leaving a contaminated excavation area or contaminated area otherwise disturbed by construction activities shall be routed into the retention basin as specified in Section 02141.

b. Exposed surfaces of contaminated and uncontaminated materials excavations shall be protected from erosion as specified in Article 3.1 above.

* P.I.D. 10-S-03, Rev. 3

3. The Subcontractor shall remove all excavated material from the excavation site and dispose of it in fills required at the site or use it for other purposes, as approved by the Contractor.

4. Unsuitable or low density subgrade material not readily capable of in-place compaction shall be excavated as directed by the Contractor and disposed of as specified in Article 3.4.

5. Adequate working space for safety of personnel shall be provided within the limits of the excavation.

6. Except as otherwise noted, care shall be exercised to preserve the material below and beyond the lines of all excavation. Where excavation is carried below grade, the Subcontractor shall backfill to the required grade or to indicated invert grade, as specified, and recompact the backfill to meet the existing conditions, except for embankment subgrade on bedrock.

7. Excavation for the convenience of the Subcontractor shall conform to the limits approved by the Contractor and shall be at no additional expense to the Contractor. Excavation for the convenience of the Subcontractor shall not be permitted in bedrock for the tailings embankment foundation.

8. Excavated material shall be placed at sufficient distance from edge of excavations to prevent cave-ins or bank slides.

9. Where practicable, suitable materials removed from excavation shall be used as fill or backfill.

10. Uncontaminated material excavation shall not be permitted on the existing slopes between the final tailings embankment and Brown's Wash unless otherwise specified.

B. Contaminated Materials Excavation:

1. The Subcontractor shall minimize the open excavation area of contaminated materials at any time during excavation work. The Subcontractor shall operate from one or two sides at one time, progressing uniformly to opposite sides for completion, unless directed otherwise by the Site Manager. Contaminated materials shall be excavated to the depths indicated on the Subcontract Drawings, or as required by the Contractor,

and placed in the proper part of the tailings embankment. The contaminated material will be excavated generally in priority of its placement in the embankment to minimize rehandling and stockpiling.

2. During the excavation operation, tests will be performed by the Contractor to determine radioactive contamination of the material to be excavated.

[3. The Subcontractor shall add moisture to materials prior to excavation of fill materials, as required, to control dust as specified in Article 3.2.H above.]*

[4.]* Excavation of Contaminated Materials from Underneath the Foundation of Crusher Building:

a. Contaminated material from underneath the floor slab of the southeast room of the Crusher Building shall be removed and the excavation backfilled with uncontaminated material and compacted as specified.

b. For detailed description of the extent of contamination, see "Information for Bidders".

c. The floor slab, if removed by the Subcontractor, shall be reconstructed with matching structural concrete and reinforcement, otherwise the holes repaired and patched. The structural concrete and the reinforcement shall be as approved by the Contractor.

C. Uncontaminated Materials Excavation:

1. Drainage Ditches Excavation:

a. General: Ditches shall be cut accurately to the cross sections and grades where indicated. Contaminated materials shall first be excavated and placed in the tailings embankment or stockpiled. All roots, stumps, rock, and foreign matter in the sides and bottom of ditches shall be trimmed and dressed or removed to conform to the slope, grade, and shape of sections indicated. Care shall be taken not to excavate ditches below the grades indicated. Excessive ditch excavation shall be backfilled to grade with satisfactory, thoroughly compacted material. Ditches shall be maintained until final acceptance of the Work.

* P.I.D. 10-S-03, Rev. 3

b. Ditches shall be excavated true to line and grade. Any erosion which occurs to ditch excavation shall be repaired with compacted backfill. All such repairs shall be at Subcontractor's expense and shall not be included in pay quantities, unless otherwise shown on the Subcontract Drawings.

c. Drainage ditch subgrade shall be prepared as specified in Article 3.7 below. Finish grading shall be done in such a manner that the side slopes are rendered smooth surfaces. All rocks, brush, roots, large clods, and other objects shall be removed.

2. Wastewater Retention Basin Excavation:

a. The wastewater retention basin shall be constructed to the lines and grades shown on the Subcontract Drawings. Contaminated materials shall first be excavated and stockpiled or placed in the tailings embankment as shown on the Subcontract Drawings, then the excavation and fill for the retention basin shall be accomplished.

b. The retention basin shall be demolished when no longer required and the area graded as shown on the Subcontract Drawings and as specified in this Section.

c. Construction of the retention basin shall also conform to the requirements specified in Section 02141.

3. Radon Barrier Borrow Area Excavation:

a. Borrow area shall meet all permit and negotiated requirements as required by the Contractor.

b. Necessary clearing, grubbing, and disposal of debris shall be performed by the Subcontractor as incidental operations to the borrow excavation.

c. The material shall be excavated after stripping the topsoil to a minimum depth of 2 feet.

3.4 DISPOSAL OF EXCAVATED MATERIALS

A. Contaminated Materials: All contaminated materials excavated from the tailings pile, retention basin, other areas of the site and vicinity properties, and demolished

materials and debris resulting from all sources shall be used in the construction of the tailings embankment as specified herein. Contaminated material will be placed in the tailings embankment by priority generally as specified herein. Radiological monitoring of contaminated materials or construction expediency may change placement priority, as directed by the Contractor.

B. Uncontaminated Materials:

1. Materials excavated from the site, including excavations for trenches, drainage ditches and retention basin which do not classify as contaminated materials, shall be used as uncontaminated material fill for construction of various features including site grading, or stockpiled for later use.

2. Where used in fills, such material shall be transported directly from the excavation and placed in its final position in such fills whenever possible. If required by the Subcontractor's schedule, the material may be placed temporarily in stockpiles at approved locations. Material in stockpile shall be protected from contamination of any kind that would render it unsuitable for use in fills.

3. [Select Fill, Type A, shall be used in the construction of the tailings embankment.]*.

4. Select Fill, Type B, shall be used as fill and backfill for finish grading of the site within the final site boundary area.

5. All other areas requiring uncontaminated fill shall be filled with common fill.

C. Garbage, refuse, debris, oil, and any waste material which is harmful to the environment shall be removed from the job site and disposed of offsite in a manner approved by the authority having jurisdiction over the offsite disposal facility.

D. All operations in the stockpile areas throughout the Work shall be in strict conformity with the requirements of this Section. The Subcontractor shall ensure that silty water from the stockpile areas does not enter nearby waterways. If required, temporary berms and detention ponds shall be constructed by the Subcontractor.

* P.I.D. 10-S-03, Rev. 3

3.5 FILL CONSTRUCTION

A. General Requirements:

1. Fill materials shall be placed and compacted to the lines and grades shown on the Subcontract Drawings or as required by the Contractor.

2. Prior to placement of uncontaminated fill materials, the subgrade will be radiologically surveyed by the Contractor to confirm that EPA standards have been met. These radiological surveys may cause delays to backfill operations of up to seven working days. The Subcontractor shall plan his work accordingly.

3. If any portion of the materials placed as fill does not meet the specified requirements, the Subcontractor shall remove such material and replace it with fill materials meeting the specification at no additional cost to the Contractor.

4. Constructed fills shall be maintained to meet the requirements of this Specification until final completion and acceptance of the Work. This shall include all measures to prevent erosion or contamination during construction, including contamination by radioactive material. During seasonal or other extended shutdowns, all exposed surfaces shall be protected with special treatments specified in Article 3.1 above.

[5. The Contractor will perform additional in-place density and moisture content tests within the first 1000 cubic yards of windblown-contaminated material placement and within the first 1000 cubic yards of placement of contaminated materials from the main tailings pile. The Subcontractor shall compact the materials as specified in Article 3.5.D.4, but may be directed to vary the number of passes and to construct multiple lifts. The Contractor will select the contaminated materials to be used. The Subcontractor shall cooperate with the Contractor in performing these additional tests, including tests between successive passes.]*

B. Placing Requirements:

1. Prior to placement of materials, the in-place density of the subgrade for the retention basin dike shall be as specified in Article 3.8. Subgrade preparation, where required, shall be as specified in Article 3.7.

* P.I.D. 10-S-03, Rev. 3

2. No material shall be placed on any portion of the subgrade or against or upon any structure until consent to place such fill has been obtained from the Contractor.

3. Fill materials may require moisture conditioning (wetting or drying) prior to compaction. Some tailings may require spreading and extended drying time prior to compaction. [Moisture addition to contaminated materials shall be as specified in Article 3.2.H.]*

4. Fill materials shall be placed in continuous and approximately horizontal layers for their full length and width unless otherwise specified or specifically permitted by the Contractor.

5. Method of dumping and spreading the materials shall ensure uniform distribution of the material.

6. Unless otherwise specified herein, loose thickness of each layer of contaminated and uncontaminated materials shall not be greater than that required to achieve the required compaction, and in no case shall exceed 12 inches.

7. Cover Construction:

   a. [Three-foot thick radon barrier shall be placed in four lifts. Each lift shall be approximately 9-inch thick compacted.]* The first lift shall be spread over the final contaminated material surface by a bulldozer ensuring that no underlying contaminated materials surface is disturbed.

   b. [Moisture content of preceding in-place radon barrier lift with the exception of top two inches shall be maintained at not less than optimum minus one percent. The moisture content shall be maintained as specified until the next lift, including bedding material, is placed and compacted. The Contractor will verify this specification requirement, as necessary, by testing in-place moisture content of samples taken from 2 to 4 inches beneath the top surface of the compacted radon barrier lift.

   c. Mositure added to the radon barrier materials shall be applied in a manner that prevents runoff onto contaminated materials.]*

* P.I.D. 10-S-03, Rev. 3

[Text Deleted]*

[d.]* Placement and compaction of bedding and erosion protection materials shall be as specified in Section 02278.

8. Unless otherwise indicated, fill materials shall be placed to a grade no flatter than 2 percent to facilitate drainage of water. In areas where ponding cannot be prevented or ponding has occurred and fill is required to be placed, placing shall begin only after the area is dewatered and permission to place is obtained from the Contractor.

9. Materials shall not be placed on frozen subgrade or embankment material foundations, nor shall frozen material be used as fill.

10. Disposing of bulky materials shall be done with care to minimize the volume of voids created in the disposal embankment fill. Pieces of wood, concrete, and steel members shall be cut or broken up as specified in Section 02051, and placed to avoid nesting. Such bulky materials shall be placed in the lower lifts of the tailings embankment as determined by the Contractor. Bulky materials from vicinity properties materials stockpile and from the demolition of temporary facilities at the end of construction shall be placed as low as practicable within the embankment.

11. When no longer needed for control of contamination, as determined by the Contractor, the temporary drainage ditches, retention basin, sumps, and the like shall be removed and the area restored and finish graded as shown on the Subcontract Drawings.

12. [When fill is placed against an existing slope steeper than 3 (horizontal) to 1 (vertical), except the excavation slope for the tailings embankment foundation, the existing slope shall be terraced as the fill is constructed.]* Terraces shall be cut nearly horizontal a minimum of 6 feet into the existing slope as the fill is brought up in layers. Material cut for terraces shall be used for the adjacent fill, if suitable, or shall be used elsewhere for site grading.

* P.I.D. 10-S-03, Rev. 3

C. Mixing Bentonite:

1. Mixing of bentonite shall not be accomplished in-place. If bentonite is mixed on the ground, loose material to be mixed with bentonite shall be placed on a 1-foot thick layer of specified radon barrier material rolled to a firm condition to avoid contamination by unacceptable materials.

2. [Radon barrier material shall be thoroughly mixed with the specified equipment with a minimum of six percent, by weight, of the specified bentonite. The dry weight of radon barrier material without bentonite is to be multiplied by 0.06 to determine the minimum dry weight of bentonite to be added to the radon barrier material. The Subcontractor shall be responsible for spreading and mixing the specified amount of bentonite. The Contractor will verify that the proper amount of bentonite is mixed with radon barrier material based on respresentative measurements of soil and bentonite weights and on representative moisture contents of soil and bentonite.]*

3. [Moisture conditioning of radon barrier materials prior to, during, and following mixing with bentonite shall be at a suitable level or levels to achieve a thorough composite mixture, shall permit uniform and effective addition of any required additional moisture, and will be subject to approval by the Contractor.]*

4. [Mixing of bentonite with radon barrier material shall produce a thoroughly mixed, uniform composite mixture, as approved by the Contractor. The Contractor will verify thorough mixing to a uniform condition by visual inspection. The method of mixing shall be subject to approval by the Contractor. If a pug mill is used, ASTM C94 will be used as a guide for mixing soil and bentonite, as approved by the Contractor. The Contractor reserves the right to suspend or require the Subcontractor to modify operations in the event that problems with dust and windborne bentonite affects the amount and uniformity of bentonite mixing, as determined by the Contractor.]*

D. Compaction Requirements:

1. Each layer of fill materials, except gravel fill [and contaminated]* materials, shall be compacted to a minimum density specified in Article 3.8.

* P.I.D. 10-S-03, Rev. 3

2. [During compaction, the moisture content of fill material shall be maintained to achieve specified density and as otherwise specified herein. Uniform moisture distribution shall be obtained by disking, blading, or other methods approved by the Contractor prior to compaction of a layer except for contaminated materials.]*

[3. The Subcontractor shall minimize the moisture content of contaminated materials during and following placement and compaction to the extent practicable. The Contractor will monitor dust control moisture added to contaminated materials.]*

[4. Contaminated materials shall be placed and compacted as follows:

a. Contaminated material shall be placed in approximately 10-inch thick maximum loose lifts prior to compaction. Contaminated materials other than tailings pile and subpile materials, as determined by the Contractor, shall be compacted by a minimum of four passes of a Caterpillar 825 tamping-foot roller and four passes of the roller specified in Article 2.5.E. Contaminated materials from the tailings pile and subpile shall be compacted by a minimum of four passes of the roller specified in Article 2.5.E. The roller specified in Article 2.5.E shall be operated at a speed between two to three miles per hour with the vibratory mechanism operating.

b. All contaminated materials shall be placed at a moisture content less than 3 percent below optimum moisture content determined according to ASTM D698. Contaminated materials shall be allowed to dry, as neccessary, to meet this moisture content requirement prior to placement in the tailings embankment. The Subcontractor may be permitted to promote drying by scarifying, harrowing, or other means, as approved by the Contractor.]*

[5. Select Fill Type A materials shall be compacted at a moisture content from optimum to 4 percent below optimum moisture content as determined by ASTM D698.]*

[6.]* If the rolled surface of any layer of the fill in place is too wet for proper compaction of the layer of fill material to be placed thereon, it shall be removed, allowed to dry or worked with harrow, scarifier, or other suitable equipment to reduce the water

* P.I.D. 10-S-03, Rev. 3

content to the required amount, and then re-compacted before the next succeeding layer of fill is placed.

[7.]* Fill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content shall be reworked to meet the density and moisture requirements or removed and replaced by acceptable fill compacted to meet these requirements.

[8.]* The final layer of compacted contaminated material shall be bladed to a uniform and smooth grade as indicated on the Subcontract Drawings, then compacted by the use of a smooth drum roller.

[9.]* Radon Barrier: Compaction of radon barrier shall be accomplished according to the following requirements:

a. Radon barrier materials shall be moisture conditioned a minimum of two hours prior to compaction. Moisture shall be added as necessary to maintain a moisture content for two hours prior to compaction equal to or greater than optimum moisture content, as determined according to ASTM D698. Moisture shall not be mixed or otherwise worked into radon barrier materials after placement of the materials over the contaminated materials.

b. In placing and working the first layer of radon barrier, care shall be taken to avoid mixing in any of the underlying radiologically contaminated soil.

c. During compaction of radon barrier materials, moisture content shall be maintained within zero to plus three percent of the optimum moisture content as determined by ASTM D698.

d. Compaction of radon barrier shall be accomplished using tamping foot rollers.

e. The radon barrier shall be compacted in [four]* lifts as specified in 3.5.B.7.a above.

f. Once minimum specified density is achieved for radon barrier, additional compaction shall not be performed.

* P.I.D. 10-S-03, Rev. 3

g. The top surface of the underlying compacted radon barrier shall be scarified to a depth of 1 inch to 2 inches just prior to placement of the overlying loose lift. Scarification shall be accomplished by suitable equipment capable of accurate depth control.

h. The top surface of the final layer of radon barrier shall be compacted with the tamping foot roller, then bladed and compacted by the use of a smooth drum roller.

[10.]* Gravel fill materials shall be placed as shown on the Subcontract Drawings and shall be compacted by a minimum of four passes of the specified vibratory roller.

[11.]* Brown's Wash dike shall be constructed by dumping common materials excavated from the tailings embankment area as shown and shaping in the form of a dike as shown on the Subcontract Drawings. Compaction of the fill shall be accomplished by routing of the hauling equipment. Dike shall be removed as part of finish grading of the Site.

[12.]* Uncontaminated fill material in the stockpile areas shall be placed by spreading with a bulldozer and track walking. Compaction shall be accomplished by routing of hauling and spreading equipment units.

[13.]* Compaction of common fill with more than 30 percent retained on a 3/4-inch standard sieve:

a. Materials placed as common fill shall not total greater than 3 foot compacted thickness in any area, except in the areas of the existing tailings pile, retention basin, and nearby areas, as approved by the Contractor.

b. Prior to compaction, materials shall be moisture conditioned as approved by the Contractor.

c. Compaction shall be accomplished by any of the following combinations of passes and equipment, or approved equal combination:

1) Two passes of a Caterpillar Compactor Model 825C.

2) Two passes of a BOMAG Vibratory Roller Model 213D.

* P.I.D. 10-S-03, Rev. 3

3) Two passes of a Raygo Vibratory Roller Model 400A.

4) Three passes of a track-type tractor with ground pressure of 9.8 pounds per square inch or greater.

5) Four passes of a fully-loaded Caterpillar Wheel Tractor-Scraper Model 631E.

d. Materials shall not be used as backfill against structures.

e. Materials shall not be subject to requirements of Article 3.8.A.

3.6 FIELD QUALITY CONTROL

A. General: The Contractor will take samples and perform tests throughout the construction period, and the Subcontractor shall cooperate in providing access for the Contractor to areas where testing is to be performed and shall schedule his placing to avoid interference with the testing operations.

B. Tests: The Contractor will perform the following tests on a regular basis.

1. In-place density and moisture content tests for compacted materials where density is specified will be as follows:

[Text Deleted]*

[a.]* One test per 1000 cubic yards of select fill materials.

[b.]* One test per 500 cubic yards of radon barrier materials.

[c.]* One test per 3000 cubic yards of common fill materials except retention basin dike which will be one test per 1,000 cubic yards.

[d.]* At least two tests for each day of material placement in excess of 150 cubic yards for each material.

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[2. In-place moisture content tests for contaminated materials, one test per 2000 cubic yards. Moisture content tests will be performed to represent the moisture conditions at the time of placement.]*

[3.]* Percentage by weight passing the No. 200 sieve and percentage by weight retained on the No. 4 sieve on radon barrier materials at a minimum of one test per 1000 cubic yards of material placed with an absolute minimum of one gradation performed per day of placement. Gradation of material will be determined on material prior to mixing with bentonite.

[4.]* Gradation of gravel fill materials, a minimum of one test per 2000 cubic yards of material placed; and a minimum of one test for each day of material placement in excess of 150 cubic yards.

[Text Deleted]*

3.7 SUBGRADE PREPARATION

A. Subgrade Preparation: Subgrade preparation includes fine grading and, where specified, compaction of excavations, backfills, embankments (including stockpiles) upon which fill, [backfill, gravelly backfill, pavement,]* surfacing, base, subbase, and riprap or other structures are constructed. Compaction shall be as specified in Article 3.8 below.

B. Soft spots developed during working shall be removed or corrected.

C. Subgrade in bedrock excavation for the tailings embankment shall be excavated to the lines indicated on the Subcontract Drawings. Loose material shall be removed to the extent practicable. [Subgrade shall not be compacted prior to Select Fill Type A layer placement. The Subcontractor shall get the tailings embankment subgrade inspected and approved by the Contractor prior to placement of Select Fill Type A materials.]* The Subcontractor shall minimize disturbance to the subgrade once Contractor's approval has been obtained.

D. The entire surface of the subgrade for retention basin dike shall be plowed, harrowed, and mixed to a depth of at least 6 inches. Compaction shall be carried out for the full area below finished subgrade to at least the density

* P.I.D. 10-S-03, Rev. 3

specified in Article 3.8 below. Soft areas developed or encountered during working shall be corrected as specified in Paragraph B.

3.8 COMPACTION DENSITIES

A. Each layer of embankment and backfill shall be compacted to at least the following percentage of maximum dry density, as determined by the ASTM D698 test method:

1.	Subgrade for Retention Basin Dike:	90 percent
2.	Road Embankment:	98 percent
3.	[Select Uncontaminated Material, Type A]*	95 percent
4.	Other Embankments:	90 percent
5.	Radon Barrier:	100 percent
6.	Trench Backfill:	95 percent
7.	Site Restoration:	90 percent

3.9 DISPOSAL OF DEMOLISHED MATERIALS AND DEBRIS

A. All demolished materials and debris including contaminated cleared materials shall be disposed of in the tailings embankment conforming to the applicable provisions of this Section and as required by the Contractor.

B. During construction of the tailings embankment, provision shall be made to leave required space at proper location in the embankment for the placement of the demolished materials and debris.

[C. At locations around debris where compaction is impractical to accomplish according to requirements of Article 3.5.D.4.a, alternate methods of compaction shall be used, as approved by the Contractor. Alternate methods of compaction shall achieve the same densities obtained in the same materials compacted according to Article 3.5.D.4.a.]*

* P.I.D. 10-S-03, Rev. 3

3.10 VICINITY PROPERTIES MATERIALS

A. Vicinity properties materials will be delivered and stockpiled near the tailings embankment area by others. The location of the stockpile is shown on the Subcontract Drawings. The approximate quantity is estimated at [25,000]* cubic yards. The delivery and stockpiling operations are expected to continue during the term of this Subcontract. The Subcontractor shall excavate the materials from the stockpile only after the delivery to the site of all materials is completed or as otherwise directed by the Contractor, transport to the tailings embankment, and place in the tailings embankment.

B. Organic material shall be distributed throughout any layer to avoid large pockets in one area. The placement shall conform to the applicable provisions of this Section and as required by the Contractor.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement for payment for the following items of excavations and fills will be by the cubic yards of material excavated. The quantities for payment will be computed from lines and dimensions shown, or by average end area method from surveys conducted before and after excavation operations as shown on the Subcontract Drawings, or by the methods determined by the Contractor. Separate measurement for payment will not be made for temporary stockpiling or for placement of the materials in their final locations.

1. Excavation of contaminated materials from existing tailings pile[, wastewater retention basin foundation and Brown's Wash dike foundation]* and placement in tailings embankment. (Bid Schedule Item 401)

2. Excavation of contaminated materials from other areas of the Site and placement in tailings embankment. Other areas of the site shall include, but not be limited to, drainage ditches, [text deleted]* and windblown areas. (Bid Schedule Item 402)

3. Excavation of contaminated materials under the Crusher Building foundation and placement in tailings embankment. (Bid Schedule Item 403)

* P.I.D. 10-S-03, Rev. 3

4. Excavation of vicinity property materials from stockpile and placement in tailings embankment. (Bid Schedule Item 404)

B. Measurement for payment for the following items of excavation will be by the cubic yards of materials excavated. The quantities for payment will be computed from lines and dimensions shown, or by average end area method from surveys conducted before and after excavation operations as shown on the Subcontract Drawings, or by the methods determined by the Contractor.

1. Excavation of uncontaminated materials from southeast diversion ditch. (Bid Schedule Item 212)

2. Excavation of uncontaminated materials for retention basin. (Bid Schedule Item 214)

3. Excavation of uncontaminated materials from tailings embankment area. (Bid Schedule Item 801)

C. Measurement for payment for the following items of fills will be by the cubic yards of materials placed. The quantities for payment will be computed from lines and dimensions shown, or by average end area method from surveys conducted before and after placement as shown on the Subcontract Drawings, or by the methods determined by the Contractor. Separate measurement for payment will not be made for excavation, transportation and stockpiling of materials.

1. Placement of excavated uncontaminated Materials as common fill for retention basin dikes. (Bid Schedule Item 213)

2. Placement of excavated uncontaminated materials as common fill or backfill for final site grading of the area outside of the final site boundary. (Bid Schedule Item 802)

3. Placement of excavated uncontaminated materials from tailings embankment area as select fill, Type B, for finish grading of the site within the final site boundary. (Bid Schedule Item 803)

4. Placement of excavated uncontaminated materials from tailings embankment area as select fill, Type A for tailings embankment. (Bid Schedule Item [405]*)

* P.I.D. 10-S-03, Rev. 3

5. Placement of excavated uncontaminated materials as common fill for Brown's Wash dike. (Bid Schedule Item [215]*)

D. Measurement for payment for the following items of fills will be by the cubic yards of materials placed. The quantities for payment will be computed from lines and dimensions shown, or by average end area method from surveys conducted before and after placement as shown on the Subcontract Drawings, or by the methods determined by the Contractor.

1. Furnish and place radon barrier material (including bentonite) in tailings embankment. (Bid Schedule Item 501)

2. Furnish and place gravel fill materials in the gullies. (Bid Schedule Item 804)

E. Separate measurement for payment will not be made for the following items, and such work will be considered incidental to the related items of work:

1. Subgrade preparation.

2. Excavation for diversion drainage ditches.

3. Stockpiling of excavated materials.

4. Required rehandling of materials.

5. Disposal of demolished materials and debris.

6. Excavation of fill placed for Brown's Wash dike and the wastewater retention basin dike.

F. Overexcavation: Overexcavation for the Subcontractor's convenience or due to error or lack of control by the Subcontractor will not be measured for payment and, instead, shall be backfilled with compacted contaminated or uncontaminated fill, as required, at the Subcontractor's expense.

G. Separate measurement for payment will not be made for any other excavations or fills specified in this Section.

H. Measurement for payment for disposal of demolished materials and debris resulting from work specified in Section 02051 of this Subcontract will be as specified in Section 02051.

* P.I.D. 10-S-03, Rev. 3

4.2 PAYMENT

A. Payment for the items of Article 4.1.A above will be by their applicable unit prices per cubic yard quoted therefor in the Bid Schedule. The prices quoted shall include full compensation for excavating, hauling, and placing the excavated materials in their final locations including all clearing at the processing site, stripping, grading, shaping, preparing subgrade, compacting, temporary stockpiling and required rehandling.

B. Measurement for payment for the items of Article 4.1.B above will be by their applicable unit prices per cubic yard quoted therefor in the Bid Schedule. The prices quoted shall include full compensation for excavating, hauling, and placing the excavated materials in temporary stockpiles, or in spoil areas if excess or unsuitable for use as fill, as required, including all clearing at the processing site, stripping, grading, shaping, and compacting such stockpiles or areas as specified.

C. Payment for the items of Article 4.1.C above will be by their applicable unit prices per cubic yard quoted therefor in the Bid Schedule. The prices quoted shall include full compensation for hauling the materials from excavated areas or retrieving the materials from temporary stockpiles, as required, and placing the excavated materials in their final locations including all clearing at the processing site, stripping, grading, shaping, preparing subgrade, and compacting or consolidating, as required.

D. Payment for items of Article 4.1.D above will be by their applicable unit prices per cubic yard quoted therefor in the Bid Schedule. The prices quoted shall include full compensation for obtaining required permits for borrow sources, developing and closing of borrow sources, obtaining the materials from borrow sources including clearing, stripping, excavating, hauling the materials from excavated areas, and placing the excavated materials in their final locations including preparing subgrade, moisture conditioning and compacting, as required. Royalties for radon barrier borrow material will be paid for by the Contractor.

E. Separate payment will not be made for the items mentioned in Article 4.1.E above. All costs for such work will be considered to be included in the prices quoted for the applicable related items of work.

F. Separate payment will not be made for any other excavations or fills specified in this Section. All costs for excavations or for furnishing and placing such fills will be considered to be included in the related items of excavation.

G. Payment for disposal of demolished materials and debris resulting from the work specified in Section 02051 of this Subcontract will be as specified therein.

END OF SECTION 02200

SECTION 02278

EROSION PROTECTION

PART 1 - GENERAL

1.1 SCOPE

This Specification Section describes the requirements for furnishing and placing riprap and bedding materials for tailings embankment cover, riprap toe protection, and spillway for wastewater retention basin.

1.2 WORK NOT INCLUDED

Erosion protection related to the construction of temporary facilities specified in Section 01500 with the exception of the wastewater retention basin is not included in the scope of work of this Specification.

1.3 RELATED WORK

A. Section 01300 - Submittals

B. Section 02200 - Earthwork: Subgrade Preparation

1.4 APPLICABLE PUBLICATIONS

A. The Publications listed below form a part of this Specification to the extent referenced. The Publications are referred to in the text by the basic designation only:

1. American Society for Testing and Materials (ASTM):

C88-83	Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C117-84	Test Method for Materials Finer than 75 um (No. 200) Sieve in Mineral Aggregates by Washing
C127-84	Test Method for Specific Gravity and Absorption of Coarse Aggregate

C131-81 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

C136-84a Method for Sieve Analysis of Fine and Coarse Aggregates (Rulers or Templates may be Substituted for Sieves for Gradation of Particles Larger Than 3 Inches)

[C142-78 Test Method for Clay Lumps and Friable Particles in Aggregates]*

C535-81 Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

2. International Society for Rock Mechanics (ISRM), 1981, Rock Characterization Testing and Monitoring, ISRM Suggested Methods, E. T. Brown, Editor, Pergamon Press, New York:

Suggested Method for Determining Indirect Tensile Strength by the Brazil Test. pp. 120-121

Suggested Method for Determination of the Schmidt Rebound Hardness pp. 101-102

1.5 PERMITS

The Contractor will provide permits for the use of borrow areas shown on the Subcontract Drawings as specified in Article SC-12 of Special Conditions. If the Subcontractor uses other sources for erosion protection materials, he shall be responsible for obtaining all required permits.

1.6 SUBMITTALS

A. If the Subcontractor determines to use other sources for erosion protection materials, a site inspection report containing the information specified in Article 2.1.A.2 below shall be submitted, in triplicate, to the Contractor for review and approval of the source, in accordance with the requirements of Section 01300.

B. During production of riprap and bedding materials from approved sources, the Subcontractor shall submit test results, in triplicate, including, as a minimum, the tests specified in Section 2.1.C.1.c. for a minimum of three representative samples of each type of material produced. Test locations and materials to be tested shall be selected at the direction of the Contractor during production.

* P.I.D. 10-S-06

C. The Subcontractor shall submit, in writing, the name and qualifications of his proposed testing laboratory to the Contractor for approval

PART 2 - PRODUCTS

2.1 MATERIALS

A. Material Sources: Erosion protection materials shall be obtained from sources approved by the Contractor. Every change in source of materials shall require approval from the Contractor.

1. Approval of the source as a borrow area does not mean that all materials excavated will meet the requirements of this Specification. Processing, selective quarrying, or both, will generally be necessary to meet the gradation and quality requirements of this Section.

2. Subcontractor-Proposed Source: The basis for approval of sources proposed by the Subcontractor for Bedding and Riprap Types A and B, except riprap for spillway for wastewater retention basin, shall be as follows:

a. A site inspection report by an engineering geologist which will include, as a minimum, an evaluation of soundness, hardness, and durability for three samples representative of the proposed source. The evaluation of durability shall be based in part on petrographic examination of rock types available from the source. Representativeness of samples shall be determined by the Contractor, based on precise location and source of sample taken in relation to the whole borrow area. The site inspection report shall include location of all samples and methods of sampling.

b. If available, examples of successful uses of the material including riprap that has been in place on other project sites for more than 20 years, rock that has functioned satisfactorily as foundation stone or building facing for 50 years or more, and abandoned quarry faces which have maintained their integrity after not being worked for approximately 50 years or more. Durability shall be indicated by lack of significant weathering or loss of volume and strength over decades of exposure to natural weathering elements.

c. The Subcontractor shall have a qualified laboratory perform the six (6) types of tests listed in Table A on each sample (minimum of 3 samples) obtained from the proposed source. Special attention shall be given to ensure that the samples are representative of the proposed rock materials. Test samples shall be obtained from within the precise locations of rock deposits from which materials will be produced.

Results of the specified tests shall be used to obtain rock quality scores using the criteria given in Table A. The score for each test is determined by multiplying the appropriate weighting factor by the score (0 to 10) based on the specific test result. The final score for each sample is the ratio of the sum of the individual test scores (six tests) to the maximum possible score, expressed as a percentage. To be acceptable, the final score must be no less than 80 percent.

3. Fremont Junction Source: Materials from the Fremont Junction Source that meet the following requirements are approved for Riprap Type B, Riprap Type A, and bedding:

a. Only particles larger than 8-inch sieve size shall be processed. The Subcontractor shall screen, crush, or otherwise process materials to meet requirements of Article 2.1.C.

b. The Subcontractor shall determine the need for and the extent of stripping of overburden materials containing deleterious materials (approx. 5 ft.). In particular, the upper portion of the gravel, cobble, and boulder stratum containing very weathered particles shall not be included in materials to be excavated and processed for riprap and bedding materials.

c. Materials to be processed shall be obtained from the following areas:

1) Area 1: South of the road only.

2) Area 2: Existing boulder pile only: Until all 36-inch or less material is used.

3) Areas 3, 4, 5 and 6.

d. The approximate locations of the abovementioned areas are shown on "Fremont Junction Site Map" included in the Information to Bidders, Volume 4, dated August, 1988.

4. Stipulations for use and Rehabilitation of Fremont Junction Source Material Site:

a. The following stipulations apply to all areas of borrow site included in Sevier and Emery Counties.

b. Prior to removal of any mineral material from the site, the top 6-8 inches of surface soil shall be removed. This surface soil shall be so placed so that it is not disturbed, compacted, or mixed with other soils or material. When material removal operations have been completed, the surface soil should be uniformly spread back over the disturbed areas of the material site.

c. All pit slopes shall be reshaped to a 4:1 final slope. This shall be done prior to replacing surface soil.

d. All disturbed areas shall be reseeded using the following seed mixture:

Name	Pound of Pure Live Seed/Acre
Pubescent Wheatgrass	3
Indian Ricegrass	4
Fairway Crested Wheatgrass	3
Yellow Sweetclover	2
Total	12

e. Seeding shall occur in the fall, no earlier than October 1. Only good quality certified seed shall be utilized. Seeding shall be done utilizing a drill. Drags shall be placed behind the drill to ensure proper coverage of the seed with soil. Drill seeding shall be done on the contour and not up and down slopes. In areas where the drill cannot be used, seed shall be hand broadcast and then the seed shall be covered with soil by hand ranking or some other suitable method. Where seed is hand broadcast, the rate of application shall be doubled.

f. Compacted areas such as roads, crushing sites, etc. shall be ripped to 6 inches to loosen the compacted soil surface and provide a more desirable seed bed.

g. Motor oil, lubricants, coolants, asphalt, tar, oils, etc. shall not be disposed of within the boundaries of the material site.

h. All debris, garbage, asphalt, and other materials generated as a result of use of the material site shall be removed from the site and be properly disposed of.

i. No holes, pits, equipment or facilities which would endanger human life, livestock or wildlife shall be maintained at the site during extraction of material or upon completion of use.

j. All survey monuments in the vicinity of the material site shall be located, marked, and protected from any type of disturbance. If monuments are destroyed, obliterated, or damaged, Utah Department of Transportation (UDOT) will, at the Subcontractor's expense, secure the services of a registered land surveyor to restore the monument at the same location or reference the monument so its exact location can be determined. Surveying procedures outlined in the Manual of Surveying Instruction for the Survey of Public Lands of the United States, latest edition, will be followed.

k. Appropriate measures shall be taken to control and prevent soil erosion on disturbed areas.

l. All test pits which remain on the material site after material removal is completed, shall be filled-in, reshaped and reseeded.

m. Disturbances created by material removal operations shall not be visible from Interstate 70. A protective berm shall be left on the west portion of the material site. No disturbance shall be allowed within 75 feet of the edge of the pit. Existing trees shall not be destroyed unless an agreement between UDOT and United States Bureau of Land Management (BLM) indicates trees can be removed.

n. Any large boulders or rocks remaining on the material site after completion of removal operations shall be buried so they are not visible.

o. It is preferred that no stockpiles be left on the material site. However, if stockpiles must be left, they shall be located in one specific pile in one specific area and the stockpile shall preferably be located in the bottom of the pit so that it is not readily visible.

p. All reasonable and necessary precautions shall be taken during construction and material removal operations to protect and preserve historic or prehistoric ruins and artifacts on or adjacent to the material site. Previously discovered archeological finds will be staked out by the Contractor. Should other such sites, ruins, or artifacts be discovered during construction or material removal operations, the activities shall be immediately suspended in the area in question and the BLM District Manager notified of the suspected values.

[5. Hastings Road Source: Materials from the Hastings Road source that meet the following requirements are approved for bedding:

a. The actual location of the Hastings Road source will be subject to approval by the Contractor.

b. Bedding materials to be placed in the tailings embankment shall have a rock quality score of 50 percent or greater according to Table A. Scoring shall be based on results of tests for specific gravity, absorption, sodium sulphate soundness, and abrasion. Scoring shall be calculated as specified in Article 2.1.A.2.c, second pagragraph.

c. The Subcontractor shall determine the need for and extent of stripping of overburden materials containing deleterious materials. Stripping will be subject to the approval of the Contractor.

d. Material shall contain no more than 3 percent of clay lumps and friable particles when tested in accordance with ASTM C142.]*

B. The materials shall be free from radioactive or other contamination.

* P.I.D. 10-S-06

C. Riprap Materials:

1. All riprap and bedding materials except riprap for spillway for wastewater retention basin:

   a. [Riprap Type "A" and "B" material shall be sound stone, resistant to abrasion, free from cracks, seams, weathering rinds and other defects as shown in the petrographic examination. Riprap Type "A" and "B" material having more than 10 percent sandstone, by volume will not be acceptable.]*

   b. [Excepting bedding materials, the shape of at least 75 percent of the material, by weight, shall be such that the minimum dimension is not less than one third of the maximum dimension.]*

   c. For record purposes the following tests shall be performed and the results shall be provided to the Contractor in accordance with Article 1.6.B.:

Test	Designation
Riprap Type A and Bedding	
Gradation	ASTM C117 ASTM C136
Specific Gravity (Saturated Surface Dry Basis)	ASTM C127
Absorption	ASTM C127
Soundness	ASTM C88
Abrasion	ASTM C131
Riprap Type B	
Gradation	ASTM C117 ASTM C136
Schmidt Rebound Hardness	ISRM Method
Splitting Tensile Strength (Modified-Loading Rate Shall Cause Failure in 1 to 3 minutes)	ISRM Method

* P.I.D. 10-S-06

2. Riprap materials for wastewater retention basin spillway shall meet either the requirements of Articles 2.1.C.1 above or the following requirements:

   a. Riprap shall consist of durable field or quarry stone approved by the Contractor, and shall be sound, hard, and free from seams, cracks, or other structural defects.

   b. Riprap materials shall have a wear not greater than 40 percent when tested in accordance with ASTM C535.

3. Gradation: Maximum nominal size for Type A Riprap shall be 4-1/2 inch and maximum nominal size for Type B riprap shall be 36 inches. Riprap materials shall be reasonably well graded within the following limits:

U.S. Standard Sieve Size (Square Openings)	Percent Passing (by weight)
Riprap Type A	
4-inch	70-100
3-inch	39-88
2-inch	8-32
1-1/2-inch	0-17
1-inch	0-5
Riprap Type B	
30-inch	96-100
25-inch	62-100
22-inch	46-95
18-inch	32-50
15-inch	20-38
10-inch	0-10

D. Bedding Materials:

1. [Bedding materials shall be obtained from a riprap borrow area or from the Hastings Road Source approved by the Contractor. The Subcontractor shall process the materials, as required, to meet the gradation requirement specified below.]*

* P.I.D. 10-S-06

2. Individual bedding material particles shall not exceed the specified layer thickness and materials shall be reasonably well graded within the following limits. The maximum nominal size of the material shall be 4 inch.

U.S. Standard Sieve Size (Square Openings)	Percent Passing (by weight)
3-inch	100
1-1/2-inch	95-100
1/2-inch	50-100
No. 4	18-58
No. 10	0-15
No. 20	0-5

E. Source Quality Control: The Subcontractor shall provide a qualified engineering geologist to monitor materials acquisition and production to ensure that only materials acceptable under Article 2.1.C.1.a and b. as confirmed by the Contractor are processed. During excavation or blasting of materials, the Contractor will inspect the site to ensure that stripping and material selection procedures are adequate to prevent inclusion of deleterious materials in processed materials. The Contractor reserves the right to inspect and test the materials.

PART 3 - EXECUTION

3.1 PLACEMENT AND COMPACTION

A. Where the required bedding material thickness is 6 inches or less, the bedding material shall be spread and compacted in one layer. Where the required thickness is more than 6 inches, the material shall be spread and compacted in two or more layers of approximately equal thickness and the maximum compacted thickness of any one layer shall not exceed 6 inches.

B. Each layer of bedding material shall be compacted by two passes of a 2- to 3-ton working weight vibratory smooth-drum roller.

C. Riprap material shall be placed so that the larger pieces are uniformly distributed and the smaller pieces serve to fill the spaces between them to provide well-keyed, densely placed layers of the specified thicknesses.

D. Riprap material may be placed by end-dumping and may be spread by bulldozers or other suitable equipment.

E. Construction equipment carrying contaminated materials shall not be allowed to move over placed riprap and bedding layers except at equipment crossovers as designated by the Contractor. Each crossover shall be cleaned of all contaminating materials as approved by the Contractor before additional materials are placed in those areas. Other construction equipment may move over placed riprap and bedding layers. The Contractor may restrict such traffic to minimize damage to completed layers. Areas of riprap and bedding layers damaged by construction equipment shall be restored to meet the requirements of the Specifications.

3.2 TOLERANCES

A. The material layers shall be placed generally to the limits and thicknesses shown on the Subcontract Drawings within the following tolerances:

1. Top of bedding material shall be within 0.1 foot of elevations shown on the Subcontract Drawings.

2. The minimum in-place thickness of riprap shall not be less than 90 percent of the thickness shown.

3. The maximum in-place thickness of riprap shall not be more than 125 percent of the thickness shown.

4. Local irregularities in the top surface of in-place riprap will be permitted provided that such irregularities do not form noticeable mounds, ridges, swales or depressions which in the opinion of the Contractor could cause concentrations of surface runoff or form ponds or gullies.

3.3 FIELD QUALITY CONTROL

A. The placement of the materials will be monitored to ensure that the following requirements are met:

1. Only materials from sources approved by the Contractor are placed.

2. The correct type of material is being placed.

3. The material being placed is clean and free of unsuitable material.

4. The material is being loaded, transported and placed in a manner which minimizes segregation and degradation.

5. The material is being placed to line and grade within the tolerances and limits designated in Article 3.2 above.

6. The material placed meets the gradation requirements specified.

B. Materials segregated or not placed according to the above requirements shall be regraded or adjusted, using appropriate equipment, to conform with the tolerances and limits given above, at no additional cost to the Contractor.

C. Materials not meeting the requirements of this Section shall be removed and replaced with specified materials at no additional cost to the Contractor. Rejected materials shall be disposed of at designated disposal sites and at no additional cost to the Contractor. Materials not meeting the grading requirements shall be reprocessed or discarded. The Contractor may require modification of the processing and grading operations to ensure that the specified grading requirements are met.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement for payment for furnishing and placing of the following materials will be by the cubic yards of material placed. The quantities will be calculated from the lines and dimensions shown on the Subcontract Drawings and from field surveys conducted before and after placement.

1. Riprap Material, Type A

2. Riprap Material, Type B

3. Bedding Material

4.2 PAYMENT

Payment for furnishing and placing the materials of Article 4.1.A above, will be by their applicable unit prices per cubic yard quoted therefor in the Bid Schedule. The prices quoted shall include full compensation for the development of the source (where applicable) including obtaining required permits (if applicable), clearing, stripping and excavating; processing the materials; testing and evaluating the materials; transporting to placement locations; placing; compacting and consolidating complete in place including the specified rehabilitation of the source. Permits and royalty payments for use of materials from the Fremont Junction Source will be provided by the Contractor.

END OF SECTION 02278

TABLE A

ROCK QUALITY SCORING CRITERIA

	Weighting Factor			Score										
	Lime-stone	Sand-stone	Igne-ous	10	9	8	7	6	5	4	3	2	1	0
Specific Gravity	12	5	9	2.75	2.70	2.65	2.60	2.55	2.50	2.45	2.40	2.35	2.30	<2.3
Absorption (%)	13	5	2	0.1	0.3	0.5	0.67	0.83	1.0	1.5	2.0	2.5	3.0	>3.0
Sodium Sulfate (%)*	4	3	11	1	3	5	6.7	8.3	10	12.5	15	20	25	>25
Abrasion (%)**	1	8	1	1	3	5	6.7	8.3	10	12.5	15	20	25	>25
Schmidt Hammer	11	13	3	70	65	60	54	47	40	32	24	16	8	<8
Tensile Strength (psi)	5	4	10	1400	1200	1000	833	666	500	400	300	200	100	<100

1. Scores derived from Tables 6.2 and 6.7 of Ref. 1.
2. Any rock to be used must be qualitatively rated at least "fair" in a petrographic examination conducted by a geologist experienced in petrographic analysis.
3. Weighting Factors derived from Table 7 of Ref. 2, based on inverse of ranking of test methods for each rock type.
4. Test methods should be standardized (ASTM, e.g.) and should be those used in Ref. 2.

Ref. 1 Lindsey, C.G., Long, L.W., and Begej, C.W. (1982), Long-Term Survivability of Riprap for Armoring Uranium Mill Tailings and Covers: A Literature Review, U.S. Nuclear Regulatory Commission, NUREG/CR-2642.

Ref. 2 De Puy, G.W., "Petrographic Investigations of Rock Durability and Comparisons of Various Test Procedures," Engineering Geology, Vol. 2, No. 2, July 1965.

* 5 cycles
** 100 revolutions

SECTION 02771

MEMBRANE LINER

PART 1 - GENERAL

1.1 SCOPE

This Specification Section describes the requirements for furnishing, installing, maintaining, removal and disposal of membrane liner systems for wastewater retention basin and spillway.

1.2 SYSTEM DESCRIPTION

A. Liner system shall consist of liner, adhesives and accessories required for sterilizing ground and installing liner, vents and other appurtenances.

B. The retention basin and spillway, where lining is required, will carry water produced from stormwater runoff, decontamination and dewatering operations, including minor amounts of sediment.

C. The installed liner will be installed without a protective earthen cover and will be exposed to all natural weathering elements, such as direct sunlight, cold and hot air temperatures, snow, ice and wind.

D. The wastewater retention basin and spillway are anticipated to be in operation for 1 to 2 years.

1.3 RELATED WORK

A. Section 01300 - Submittals

B. Section 02200 - Earthwork

1.4 APPLICABLE PUBLICATIONS

A. The Publications listed below forms a part of this Specification to the extent referenced. The Publications are referred to in the text by the basic designation only:

1. National Sanitation Foundation (NSF):

SN54 (Revised Nov. 85)
Flexible Membrane Liners

2. Federal Standard (FS):

101C Test Methods for Puncture Resistance and Elongation Test (Method 2065.1)

101C Test Method for Puncture Resistance (Method 2031)

1.5 QUALITY ASSURANCE

A. Manufacturer: The manufacturer of the liner shall have manufactured in excess of 10,000,000 square feet of membrane liner. The manufacturer shall also certify in writing that the liner meets or exceeds the NSF Standard 54 physical properties as specified in this Section and shall withstand a minimum of 3 years of outdoor weathering without cover. The manufacturer shall also certify that the liner material is formulated from 100 percent virgin domestic, first quality raw materials.

B. Fabricator: The liner fabricator shall have fabricated in excess of 10,000,000 square feet of liner.

C. Installation: The Installation Supervisor shall have supervised installation of lining material in excess of 1,000,000 square feet.

D. Installation Workers Qualifications: The installation workers shall have installed a minimum of 1,000,000 square feet of membrane liners.

1.6 SUBMITTALS

A. General submittal requirements are specified in Section 01300.

B. The Subcontractor shall submit the following to the Contractor for review and approval 30 days before placement of the material:

1. Product data.

2. Samples of material and accessories.

3. Certificate signed by the manufacturer that the system proposed meets the Specification.

4. Installation details.

5. Fabricator's or manufacturer's installation instructions.

6. Test reports.

7. Qualifications of installer and supervisor in accordance with the requirements of Article 1.5.C.

8. Certification from a recognized independent testing laboratory that the liner meets the requirements of this Specification and is suitable for its intended purpose.

1.7 SITE CONDITIONS

The Green River Project Site elevations range from 4070 feet to 4144 feet above sea level. Recorded temperatures range from a high of 107°F to a low of -25°F. The average wind speed at the Site is 4.2 mph. High winds of 19 to 38 mph occur approximately two percent of the time.

1.8 WARRANTY

A. Liner materials and factory seams shall be warranteed to be free from defects in materials and workmanship for a period of 2 years from the date of acceptance. Installation and field seams shall be waranteed free of defects for a period of 2 years from the date of acceptance.

B. Upon written notification by the Contractor, the Subcontractor shall promptly and completely repair or replace defective lining materials on site which become apparent during such 2-year period. Such repair or replacement shall be done at no cost to the Contractor. The Subcontractor shall be responsible for removal of all liquids, dirt, soil, or contaminated materials required to enable him to carry out the necessary repairs.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The liner material shall be the product of a manufacturer successfully engaged in the business of manufacturing liner materials for the last ten years.

2.2 MATERIAL

A. The thermoplastic elastomer lining material shall be manufactured from a synthetic rubber compound and shall be high density polyethylene (HDPE), chlorinated polyethylene (CPE), or polyvinyl chloride (PVC), specifically compounded for use in hydraulic facilities. In addition, the lining material shall be formulated to withstand a minimum of 3 years of outdoor exposure without cover.

B. The liner shall have a smooth uniform surface with no visible defects and shall be free of holes, blisters, gels, undispersed ingredients and any contamination or defect that may affect its serviceability. The liner shall be uniform in thickness with a maximum 10 percent deviation from the nominal thickness. The edges shall be straight and free of nicks and cuts. Inspection for pinholes shall be made prior to shipment to the field.

C. The liner material shall be specifically compounded to conform to the physical properties set forth in the National Sanitation Foundation Standard SN 54 and the standards set forth below.

Property	Test Method	Data
High Density Polyethylene (HDPE)		
Gauge (Nominal)		40 mils
Puncture Resistance	FED STD 101C Method 2065.1	175 lbs. min.
Chlorinated Polyethylene (CPE)		
Gauge (Nominal)		30 mils
Puncture Resistance	FED STD 101C Method 2065.1	175 lbs. min.
Polyvinyl Chloride (PVC)		
Gauge (Nominal)		30 mils
Puncture Resistance	FED STD 101C Method 2031	130 lbs. min.

2.3 FABRICATION

The roll goods shall be factory fabricated into optimum sized panels up to 20,000 square feet, using an approved seaming method as prescribed by the manufacturer. When the seam is tested for shear and peel, failure of the material including the seam shall not occur at the bonded surfaces.

PART 3 - EXECUTION

3.1 GENERAL

The liner systems shall be installed as shown on the Subcontract Drawings and as recommended by the manufacturer and the fabricator.

3.2 GROUND SURFACE PREPARATION

A. Surfaces to be lined shall be smooth and free of sharp rocks and vegetation. If the liner is not applied within 15 days of surface preparation, the surface shall be protected against growth of vegetation by the application of a suitable short-lived soil sterilant as approved by the Contractor. The soil sterilant used shall be compatible with the liner material to ensure against damaging the liner.

B. Certification from the Installation Supervisor shall be required stating that the surface on which the liner is to be placed is acceptable. No installation of lining shall commence until this certification is furnished to the Contractor. The receiving surface shall be kept in the accepted condition until the installation of the lining is accomplished.

3.3 FIELD SEAMS

A. PVC/CPE Liner: All field seams for PVC or CPE liner materials shall be performed using only the fabricator's approved methods, adhesives and application directions. The minimum width of overlap of field seams shall be 4 inches. The contact surfaces of the panel overlap shall be cleaned to remove all dirt, dust or other foreign materials. A nominal 6-inch overlap of liner panels shall be allowed to keep dirt out of the field seams. When bonding the seams, the temperature of the sheet and adhesive shall be not less than 55°F. Artificial heat shall be applied if ambient conditions create lower temperatures.

B. HDPE Liner:

1. Field joints shall be made with overlapping adjacent sheets and inserting a ribbon of fusion joining resin between the overlapping sheets or over the joint between them. Appropriate alternate seaming procedures as recommended by the manufacturer or fabricator such as a hot air or hot wedge method may

be proposed for the Contractor's approval. The minimum width of overlap of field seams shall be 3 inches.

a. Joints between liner sheets shall be field welded using the fabricator's fusion joining apparatus and technique. The joining procedure shall consist of softening the liner material by heated air. Directly following the application of heat, a minimum 1-1/2 inch wide hot strip of the same HDPE from which the sheet is made shall be extruded between the overlapping sheets. The overlapping sheets shall then be pressed together with a minimum pressure of 14 psi to form the fusion joint.

b. Penetrations through the liner for pipes, flashings, patches, and the like shall be field welded using a fusion joint gun. The joining procedure will consist of softening the liner material by heated air. Directly following the application of heat, a hot strip of the same high density polyethylene from which the sheet is made shall be extruded over the joint to produce the fusion joint.

c. Prior to fusion joining, all areas to become joint interfaces shall be cleansed of dust and dirt.

d. Fusion joining shall not take place unless the sheet is dry and shall not be attemped when the ambient temperature is below 45°F or above 90°F as determined by the Contractor.

3.4 INSPECTION AND TESTING

A. HDPE Liner:

1. All fusion joined seams shall be visually examined and probed for voids or imperfect bonds for their lengths.

2. All fusion joined seams shall be ultrasonically tested along their entire lengths with a testing device furnished by the Subcontractor. The device shall be capable of locating weld defects including internal cracks, unjointed interfaces, voids, cavities, gravel inclusions and other foreign particles above 1 mm (0.04 inches) in size. The Subcontractor shall furnish to the Contractor a copy of the ultrasonic test results coordinated with the seam pattern shown on the approved Shop Drawings.

3. All seams made for the HDPE liner shall be tested using vacuum testing in addition to ultrasonic testing. Vacuum testing shall consist of placing a rectangular box (approximately 30 inches long) into the liner seam. The section chamber shall be connected to the vacuum pump. A foaming agent shall be applied to the seam area under test to indicate possible leaks. The seam shall be maintained under 5 psig suction for a minimum of 10 seconds, and certification given to the Contractor that the seams will provide a film tearing bond. The test areas shall have a minimum of 3-inch overlay from the previous test section.

4. Defects found during the testing shall be repaired and retested. Such tests and adjustments shall be repeated until, in the opinion of the Contractor, the repairs are satisfactory and complete. All repairs shall be made by the Subcontractor at no additional expense to the Contractor.

5. The Subcontractor shall furnish to the Contractor, on a daily basis, if requested, seam samples for testing cut from that days installation. The samples may be tested to determine strength and durability. Any seams not meeting the requirements specified herein shall be repaired by the Subcontractor at no additional expense to the Contractor.

6. The Subcontractor shall repair all areas damaged by sampling immediately after the sample is taken. The repairs shall be made at no additional expense to the Contractor.

B. PVC/CPE Liner:

1. All field seams shall be air lance tested along their entire lengths using one eighth inch orifice at 50 psi.

2. Defects found during the testing shall be repaired and retested,. Such tests and adjustments shall be repeated until, in the opinion of the Contractor, the repairs are complete. All repairs shall be made by the Subcontractor at no additional expense to the Contractor.

3. The Subcontractor shall furnish to the Contractor, on a daily basis, if requested, seam samples for testing cut from that days installation. The samples may be tested to determine strength and durability. Any

seams not meeting the requirements specified herein shall be repaired by the Subcontractor at no additional expense to the Contractor.

4. The Subcontractor shall repair all areas damaged by sampling immediately after the sample is taken. The repairs shall be made at no additional expense to the Contractor.

3.5 GAS VENTS AND LINER HOLD-DOWNS

A. Gas vents as recommended by the manufacturer and the fabricator and approved by the Contractor shall be installed in the liner around the perimeter of the basin. Vents shall have a minimum diameter of 4 inches, located 6 inches below the top of the dike and at a maximum spacing of 50 feet on centers.

B. Liner hold-downs, as recommended by the manufacturer and the fabricator and approved by the Contractor, shall be installed over the liner on the embankment and excavation slopes. The hold-downs shall be placed on 30-foot centers or over every field seam, whichever is closer.

3.6 ANCHORING

During installation, necessary precautions shall be taken to insure the liner will not be damaged or moved by wind, rain or dust. The liner shall be installed in such a manner that the liner will be protected from damage or movement by wind, water, and dust. Venting to prevent damage to the liner shall be provided by the Subcontractor per the manufacturer's recommendations.

3.7 TEMPORARY EROSION PROTECTION-CONSTRUCTION PHASE

A. Synthetic membrane shall be placed on the prepared wastewater retention basin subgrade including the emergency spillway, as shown on the Subcontract Drawings.

B. The Subcontractor shall maintain and if required, repair synthetic membrane to provide protection from runoff erosion and contamination.

3.8 REMOVAL AND DISPOSAL OF MEMBRANE LINER

After the completion of the construction phase or when retention basin is no longer required, the synthetic membrane shall be removed, decontaminated and disposed of as required by the Contractor. If the membrane cannot be decontaminated by practical means, it shall be disposed of by cutting into strips, shredding and placing in the tailings embankment in a manner that would not induce settlement and inhibit water migration. Membrane liner shall be disposed of in the embankment by distributing among fill materials to avoid concentration in one area.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

Measurement for payment for furnishing and installing of membrane liner for the wastewater retention basin and spillway will be by the square yards of material installed. The quantities for payment will be calculated from the lines and dimensions shown on the Subcontract Drawings. The surfaces shall be measured parallel to the liner material installed.

4.2 PAYMENT

Payment for furnishing and installing of membrane liner for the wastewater retention basin and spillway will be by the unit price per square yard quoted therefor in the Bid Schedule. The price quoted shall include full compensation for furnishing all labor, materials, tools, equipment, Installation Supervisor, incidentals and for performing all work as specified including, but not limited to, preparation of subgrade, installation of vents and temporary hold-downs, and anchoring, maintaining, removal and disposal of the liner.

END OF SECTION 02771

SECTION 02832

CHAIN LINK FENCE AND GATES

PART 1 - GENERAL

1.1 SCOPE

A. This Specification Section describes the requirements for furnishing, installing, maintaining and removing chain link fencing including gates, posts, fittings, hardware, and concrete footings.

1.2 RELATED WORK

A. Section 01300 - Submittals

B. Section 02051 - Demolition and Decontamination

C. Section 02833 - Woven Wire Fences

1.3 DEFINITIONS

Definitions of fencing components shall be in accordance with ASTM F552.

1.4 APPLICABLE PUBLICATIONS

A. The Publications listed below form a part of this Specification to the extent referenced. The Publications are referred to in the text by the basic designation only:

1. Chain Link Fence Manufacturers Institute:

a. Standards for Galvanized Steel Chain Link Fence Fabric

b. Industrial Steel Specifications for Fence Posts, Gates, and Accessories

c. Standards for Chain Link Fence Installation

2. American Society for Testing and Materials (ASTM):

A120-84 Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses

A123-84 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A153-82 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A239-73 Test Method for Locating the Thinnest Spot in a Zinc (Galvanized) Coating on Iron or Steel Articles by the Preece Test (Copper Sulfate Dip) (R1983)

A370-87 Standard Test Methods and Definitions for Mechanical Testing of Steel Products

A392-84 Specification for Zinc-Coated Steel Chain-Link Fence Fabric

C33-86 Specification for Concrete Aggregates

C94-86 Standard Specification for Ready-Mixed Concrete (Rev. B)

C150-86 Standard Specification for Portland Cement

F552-83 Standard Definitions of Terms Relating to Chain Link Fencing

1.5 SHOP DRAWINGS

Pursuant to the provisions of Section 01300, three black-line or blue line prints and a reproducible transparency of fully detailed shop drawings of fence, gate and hardware, including footings and installation details, shall be submitted to the Contractor for review.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reusable materials salvaged from demolition work specified in Section 02051 shall be utilized, to the extent practical, in the construction of the fence and gates specified in this Section.

B. General: Fencing shall include fabric, framework, concrete footings, gates, closure at grade depressions, hardware, and all appurtenances and accessories as required for a complete installation. All members, except fittings, shall be steel, hot-dip galvanized after fabrication. Fittings shall be malleable iron, wrought iron, or pressed steel, hot-dip galvanized after fabrication. Fence

fabric and tension wire shall be zinc-coated as specified. Heights of fences shall be as shown on the Subcontract Drawings. Tolerance for fabric height is ±1 inch.

C. Fence Fabric: No. 9 gage, chain-link steel wire helically woven into 2-inch diamond mesh, hot-dip galvanized, conforming to ASTM A392. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage. Loops of knuckled selvage shall be closed or nearly closed with a space not exceeding the diameter of the wire. The twisted wire shall be twisted in a closed helix of 1-1/2 machine turns equivalent to three full twists, and cut at an angle to provide sharp barbs. The wire ends beyond the twist shall be at least 1/4-inch long. Steel wire for the fabric, when drawn to the wire gage specified, shall have a minimum tensile strength of 75,000 pounds per square inch when tested in accordance with ASTM A370. Coating of fabric shall be Class II, 2.0 ounces of hot-dip zinc galvanizing per square foot of uncoated wire surface. The Standard length of fabric roll shall be 50 linear feet ±1 percent. Each roll shall be a one-piece length. Tolerance for fabric heights shall be plus or minus 1 inch.

D. Posts:

1. Post shall be Schedule 40 galvanized pipe. Use shall be in accordance with the following table except as noted on the Subcontract Drawings. All pipe shall conform to ASTM A120 for weight and galvanized coating. Line post shall be spaced at no more than 10-foot centers.

Post Type and Shape	Nominal Pipe Size, Inches
2. End, Corner and Pull Posts:	
Round	2.5
3. Intermediate or Line Posts:	
Round	2.0
4. Gate Posts:	
Single Leaf Gate Opening Width:	
6 Feet and Less:	
Round	2.5
6 to 13 Feet:	
Round	3.5
13 to 18 Feet:	
Round	6.0
Over 18 Feet:	
Round	8.0

E. Post-Bracing Assembly: Horizontal braces shall be 1-1/4 inch Schedule 40 steel pipe, conforming to ASTM A120. Diagonal truss type braces shall be 3/8-inch diameter galvanized steel rods with turnbuckle adjustment. Couplings, fittings, and attachment accessories shall be included as required. Horizontal braces (intermediate rails) shall be provided at all corners, terminals, pulls, and at gate posts.

F. Wire Ties and Clips: Wire ties or clips shall be provided for attaching fabric to line posts, top rail, or tension wire. Wire ties and clips shall be at intervals not greater than 15 inches when attaching fabric to line posts, and the space interval shall not exceed 24 inches when attaching fabric to top rails or tension wire. Wire ties and clips shall be not less than the fabric wire gage size and of the same material and coatings. The minimum weight for zinc coated wire ties and clips is 0.8 ounces of zinc per foot of coated surface area.

G. Tension Wire, Zinc-Coated Steel: Tension wire for top and bottom edge support of fence fabric shall be No. 7 gage marcelled or crimped coil spring hard tempered carbon steel wire with minimum tensile strength of 70,000 psi, and zinc coating of not less than 1.20 ounce per square foot of coated area.

H. Post Caps: Post caps shall be standard malleable iron, wrought iron, or pressed steel, galvanized, designed as a weathertight closure cap for tubular posts.

I. Stretcher Bars: Stretcher bars shall be one-piece lengths equal to full height of fabric with a minimum crosssection of 3/16 inch by 3/4 inch. Provide one stretcher bar for each gate and end post, and 2 for each corner and pull post.

J. Stetcher Bar Bands: Bands shall be heavy pressed steel, or malleable iron, spaced not over 15 inches on center to secure stretcher bars to end, corner, pull, and gate posts.

K. Gates:

1. Gates shall be of chain link fabric, single- or double-leaf swing type as shown on the Subcontract Drawings and furnished complete with all hardware and accessories as required. For payment purposes, the size of the gate shall be measured in terms of the length of each gate leaf.

2. Gate Frames: Frames shall be round pipe to match posts in accordance with the following table:

Gate Size	Nominal Pipe Size
Leaf Width 8 Feet or Less: Round	1-1/4 Inch Schedule 40
Leaf Width Over 8 Feet: Round	1-1/2 Inch Schedule 40

3. Fabrication of Gates: Assemble gate frames by welding or with fittings and rivets for rigid connections. When fittings are used as the construction method for gate frames, the frames shall be fitted with 5/16-inch minimum diameter truss rods. The frames shall be zinc-coated after fabrication. When frames are not zinc-coated after fabrication the welds shall be coated with a zinc rich paint. Use same fabric as for fence. Install fabric with stretcher bars at vertical edges, and tie wires at top and bottom edges. Attach stretcher bars to gate frame at not more than 15 inches on center. Attach hardware with rivets or by other means which will provide security against removal or breakage. Provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware, and accessories. Provide diagonal crossbracing consisting of 3/4-inch diameter adjustable length truss rods on gates where necessary to provide frame rigidity without sag or twist. All gates shall be constructed so that they may be operated by one person.

4. Gate Hardware: Provide the following hardware and accessories for each gate:

   a. Gate Hinges: Gate hinges shall be of adequate strength for the gate, and shall have large bearing surfaces for clamping or bolting in position. Hinge action shall be such that gates may be easily opened and closed by one person. Hinges shall provide for full 180° swing of gate leaf.

   b. Latch: Forked type or plunger-bar type to permit operation from either side of gate. Provide padlock eye as integral part of latch. Locking

devices shall be constructed so that the center drop rod or plunger bar cannot be raised when locked.

c. Keeper: Provide keeper, which automatically engages the gate leaf and holds it in the open position until it is manually released, for each gate leaf.

d. Double Gates: Provide gate stops for double gates, consisting of mushroom type or flush plate with anchors. Set in concrete to engage the center drop rod or plunger bar. Provide locking device and padlock eyes as an integral part of the latch, requiring one padlock for locking both gate leaves.

L. Accessories: Furnish all miscellaneous materials and accessories, ties, clips, anchors and fastenings as required for a complete installation. Unless otherwise specified, all ferrous items shall be hot dip zinc-coated with an average weight of not less than 1.2 ounces of zinc per square foot of coated surface area.

M. Galvanizing:

1. Fence and gate framework, hardware and appurtenances shall be hot dip galvanized per ASTM A120, A123, or A153 as applicable.

2. Galvanizing of wire fabric shall be after weaving in accordance with ASTM A392, immersions when tested in accordance with ASTM A239.

2.2 FABRICATION

Chain link fencing shall be fabricated and pre-assembled by the manufacturer in the factory or shop as far as practicable.

2.3 CONCRETE

Concrete: ASTM C94; 2000 psi at 28 days; normal Portland cement conforming to ASTM C150; 3-inch to 5-inch slump; maximum 1-inch size aggregates conforming to ASTM C33; and clean water.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation of fencing shall be in accordance with the Subcontract Drawings, shop drawings, and the manufacturer's detailed installation drawings, instructions, and recommendations. All posts shall be plumb and rigid after installation. Chain-link fabric shall be smooth and uniformly stretched tight and straight. Tension wires shall be pulled taut.

B. Chain-link fabric shall be extended to provide approximately 4 inches clearance to the surfaces of grade depressions, drainage swales or ditches. The extended fabric shall be the same piece of the fencing material or a piece of fabric securely attached or welded to adjacent fabric of the fencing. A stretcher bar shall be provided through the vertical height of the fence at the lowest point in the depression to stiffen the extended fabric. The stretcher bars shall be threaded through and attached to the fabric by wire ties. At drainage ditches or swales, no line posts shall be installed within 5 feet of the centerline of the drainage ditches or swales. Line posts shall be spaced evenly from the centerline of the ditch or swale.

C. Gates shall be installed plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricate. Gates shall operate smoothly and easily to minimize noise.

D. All posts shall be embedded into concrete except intermediate or line posts, which may be mechanically driven 3'6" into the ground, as shown on the Subcontract Drawings.

E. Dimensions of drill holes for post footings and concrete embedment of the posts shall be as shown on the Subcontract Drawings.

F. Line posts shall be spaced at no more than 10-foot centers.

G. Corner posts shall be installed at all changes in direction where the deflection angle exceeds 30 degrees.

3.2 CONCRETE PLACEMENT

Concrete shall be placed around posts in a continuous pour. Each post shall be checked for vertical and top alignment, and shall be held in position during placement and finishing operations.

3.3 MAINTENANCE AND REMOVAL

The fence and gates constructed under the Subcontract shall be maintained during the term of the Subcontract and later removed and disposed of as Subcontractor's property when no longer required.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement for payment for chain link fence will be by the linear feet of fence installed and removed as shown on the Subcontract Documents and as accepted by the Contractor. Measurements will be made along the top of the fence to the nearest foot.

B. Measurement for payment for furnishing and installing following chain link gates will be by the number of each size and type of gate installed. For payment purposes each gate leaf will be considered as a gate unit:

1. Size: 3-foot long, One Number.

2. Size: 12-foot long, Two Numbers.

4.2 PAYMENT

A. Payment for chain link fence will be by the unit price per linear foot quoted therefor in the Bid Schedule. Payment shall include full compensation for furnishing all labor, tools, equipment, and incidentals, and for performing all work involved in constructing, maintaining, and removing fences, including any clearing, stripping, tree removal, excavation, concrete or cement, complete in place, as shown on the Drawings and as accepted by the Contractor.

B. Payment for furnishing and installing chain link gates will be by the unit price per each type and size quoted therefor in the Bid Schedule.

C. Unit prices quoted shall include full compensation for furnishing labor, materials, tools, equipment and accessories, and for performing all work including, but not limited to, clearing, stripping, tree removal, excavation, maintenance, removal and disposal of fence and gates.

END OF SECTION 02832

SECTION 02833

WOVEN WIRE FENCE

PART 1 - GENERAL

1.1 SCOPE

This Specification Section describes the requirements for furnishing, installing, maintaining and removing woven wire fence as shown on the Subcontract Drawings and as specified in this Section.

1.2 APPLICABLE PUBLICATIONS

A. The Publications listed below form a part of this Specification to the extent referenced. The Publications are referred to in the text by the basic designation only:

1. American Society for Testing and Materials (ASTM):

A116-81	Specification for Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric
A121-86	Specification for Zinc-Coated (Galvanized) Steel Barbed Wire
C33-86	Specification for Concrete Aggregates
C94-86	Standard Specification for Ready-Mixed Concrete (Rev. B)
C150-86	Standard Specification for Portland Cement

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fencing shall include woven wire, posts, barbed wire, and all appurtenances and accessories required for complete installation.

B. Barbed wire shall conform to the requirements of ASTM A121, and shall consist of three lines of double stranded 12-1/2-gage galvanized wire with either 2-point or 4-point barbs spaced at 5-inch intervals. Galvanizing shall be Class 3.

C. Rectangular woven wire shall be 12-1/2-gage galvanized steel wire conforming to the requirements of ASTM A116 Class 3 coating. The height shall be 32 inches consisting of eight horizontal wires with vertical stays spaced 6 inches apart.

D. Line post shall be tee, channel or U-bar shape, 1.33 lbs. per foot.

E. Braces shall be 1-1/4-inch Schedule 40 steel pipe, or steel angle section, 2 x 2 x 3/16 inches.

F. End, corner and pull posts shall be 2-inch Schedule 40 steel pipe, or steel angle section 2-1/2 x 2-1/2 x 1/4 inches.

G. Hardware for connecting members shall conform to commercial standards.

2.2 CONCRETE

Concrete: ASTM C94; 2000 psi at 28 days; normal Portland cement conforming to ASTM C150; 3-inch to 5-inch slump; maximum 1-inch size aggregates conforming to ASTM C33; and clean water.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Wire fence shall be constructed in accordance with the details shown on the Subcontract Drawings unless otherwise directed by the Contractor.

B. Line posts shall be set plumb and to the depth and spacing shown on the Subcontract Drawings.

C. Fence wire shall be stretched by mechanical stretcher or other device designed for such use. The length between pull posts shall not exceed 660 feet for woven wire.

3.2 CONCRETE PLACEMENT

Concrete shall be placed around posts in a continuous pour. Each post shall be checked for vertical and top alignment, and shall be held in position during placement and finishing operations.

3.3 MAINTENANCE AND REMOVAL

The fence constructed under the Subcontract shall be maintained during the term of the Subcontract and later removed and disposed of as Subcontractor's property when no longer required.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

Measurement for payment for woven wire fence will be by the linear feet of fence installed as shown on the Subcontract Drawings and as accepted by the Contractor. Measurements will be made along the top of the fence to the nearest foot.

4.2 PAYMENT

Payment for woven wire fence will be by the unit price per linear foot quoted therefor in the Bid Schedule. Payment shall include full compensation for furnishing all labor, tools, materials, equipment, and incidentals, and for performing all work involved in constructing, maintaining and removing fences, including any clearing, stripping, tree removal, excavation, concrete work, complete in place, as shown on the Subcontract Drawings.

END OF SECTION 02833

SECTION 02935

SEEDING

PART 1 - GENERAL

1.1 SCOPE

This Specification Section covers seeding to establish a permanent vegetation cover for the final graded areas at the processing site.

1.2 MATERIAL STORAGE

A. Seeds shall be stored in sealed waterproof containers in a cool, dry location and shall be kept out of direct sunlight until ready for use.

B. Fertilizer shall be delivered and stored in waterproof containers which will show the chemical analysis and name of manufacturer.

C. Soil preparation materials such as manure or mountain peat shall be delivered and stockpiled.

PART 2 - MATERIALS

2.1 SEED MIX

A. The following seed mixture shall be used for seeding of final grades:

Seed Species	Seeding Rate (Pounds of Pure Live Seed Per Acre) Drill
Shadscale	1.0
Rincon Fourwing Saltbush	1.0
Castle Valley Clover Saltbush	1.0
Alkali Sacaton	0.25
Sand Dropseed	0.10
Paloma Indian Ricegrass	3.00
Total	6.35

B. The seeding rates shown are for drill applied. These rates shall be increased by 100 percent if broadcasting method of application is used. Hydroseeding shall not be used.

2.2 ACCEPTANCE OF SEED

Final acceptance of seed will be made by the Contractor based on the following: Seed shall be furnished separately or in mixture in standard sealed containers with (1) seed name; (2) lot number; (3) net weight; (4) percentages of purity and of germination; and (5) percentage of maximum weed seed content clearly marked for each kind of seed. The Subcontractor shall furnish the Contractor duplicate copies of a statement by the vendor, certifying that each lot of seed has been tested by a recognized laboratory for seed testing within 30 days of date of delivery. This statement shall include: (1) name and address of laboratory, (2) date of test, (3) lot number for each kind of seed, and (4) results of tests as to name, percentages of purity and of germination, and percentage of weed content, for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed.

2.3 FERTILIZER

Fertilizer shall be a standard commercial grade and provide the minimum percentage of available nutrients specified. Fertilizer shall be furnished in new, clean, and sealed containers with the name, weight, and guaranteed analysis of contents clearly marked.

2.4 MULCH

Mulch shall be native or locally grown hay consisting of grass or grass and alfalfa. Mulch shall be in an air-dry condition and suitable for placing with mulch blower equipment. Final acceptance of mulch will be by the Contractor.

2.5 WATER

Water used in the planting or care of vegetation shall be free of concentrations of oils, acids, alkalies, salts, or any substance that are injurious to plant life.

PART 3 - EXECUTION

3.1 PREPARATION

A. Timing: All final grades not covered by gravel or riprap shall be seeded using the seed mixes specified in Article 2.1.A above. Seeding materials shall not be applied during windy weather, when the ground is excessively wet or frozen, or when snow is present.

B. Grading and Seedbed Preparation: Before applying seed for permanent cover of a given area, stockpiled topsoil and select fill shall be put in place evenly and the area shall be graded as shown on the Subcontract Drawings, with surfaces sloping gradually towards drainage courses, with no enclosed low spots where water can accumulate. Areas to be seeded that have been damaged by erosion, compaction or other causes shall be restored prior to seeding. All areas shall be cultivated by contour cultivating 4 to 6 inches deep to provide a reasonably firm but friable seedbed. A minimum of 6 inches of surface soil shall be in a loose condition at the time of fertilizer and seed application.

C. Enrichment: Drainage ditches and final grades shall be enriched by applying fertilizer to the surface of prepared soil prior to the application of the seed and mulch. Fertilizer consisting of 77% nitrogen (N_2) and 23% phosphate (P_2O_5) shall be applied at the rate of 260 pounds per acre, unless Subcontractor can demonstrate to the Contractor that a different fertilizer mix or a lesser rate of application is justified on the basis of laboratory testing of the soil to be seeded.

3.2 APPLICATION

A. Seeding shall be completed during the period of September 1 and November 15. Seed shall be applied by either a rangeland drill or by broadcasting at the rates specified. The rangeland drill shall have drill spacing of 12 inches and seed depth of 1/2 to 1 inch. The soil shall be compacted following seeding.

B. Mulch shall be applied to seeded areas as soon as practical at a rate of 1.5 tons per acre. The purpose of the mulch is to promote growth and provide temporary stabilization. Mulch shall be secured into the soil with a crimping disk implement or by other suitable equipment as

approved by the Contractor. Mulching shall not be done in the presence of free surface water.

3.3 CARE DURING CONSTRUCTION

The Subcontractor shall be responsible for protecting and caring for areas seeded before final acceptance of the work. The Subcontractor shall repair any damage to seeded areas caused by construction operations without additional compensation.

3.4 PLANT ESTABLISHMENT

Since seed applied in the late fall is intended to germinate the following spring, the Subcontractor shall be responsible for seeded areas 180 days following seeding. If satisfactory growth is not established by the end of this period, reseeding by the Subcontractor will be required at no cost to the Contractor.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement for payment for seeding will be by the acres of surfaces actually seeded and approved. Quantities shall be computed from measurements and surveys of the seeded planes.

B. Separate measurement for payment will not be made for any incidental work and services, including, but not limited to, loosening the surface, applying lime and fertilizer, mulching, and watering related to seeding of cuts and fill areas.

4.2 PAYMENT

Payment for seeding will be by the unit price per acre quoted therefor in the Bid Schedule. The price quoted shall include full compensation for furnishing all materials, tools, equipment, incidentals, labor, and for performing all work specified herein for complete work.

END OF SECTION 02935

Subcontract Drawings

UNITED STATES
DEPARTMENT OF ENERGY

UMTRAP
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

CONSTRUCTION DRAWINGS

SI
APERTURE
CARD

Also Available On
Aperture Card

GREEN RIVER, UTAH

QA REVIEWED FOR
QUALITY REQUIREMENTS
BY [illegible] 1/27/88

REGISTERED PROFESSIONAL ENGINEER
No. 7366
PERRIN B. GRIFFIN
3 Feb 88
STATE OF UTAH

900104-0091-01

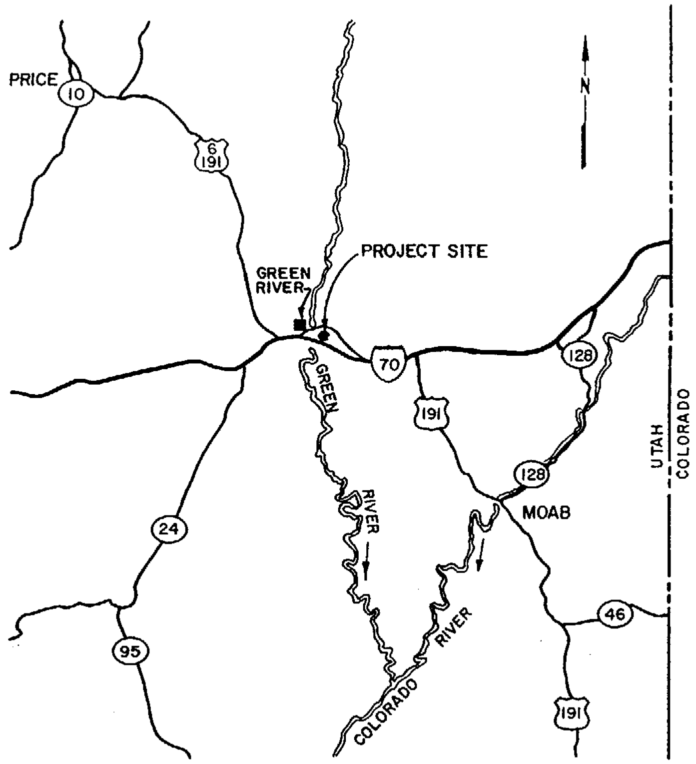
	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED [illegible] / DRAWN RBC	GREEN RIVER SITE GREEN RIVER, UTAH
CHECKED [illegible]	TITLE SHEET
INSPECTED [illegible]	
RECOMMENDED [illegible]	
APPROVED [illegible] DATE 1-27-88	[illegible] 28 Jan 88 A.D. Cmatna 28 Jan 88
DOE PROJECT ENGINEER [illegible] DATE 1/28/88	

MORRISON-KNUDSEN ENGINEERS, INC.
A DOMESTIC-INTERNATIONAL COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. GRN-PS-10-0501
REV. 0



LEGEND:

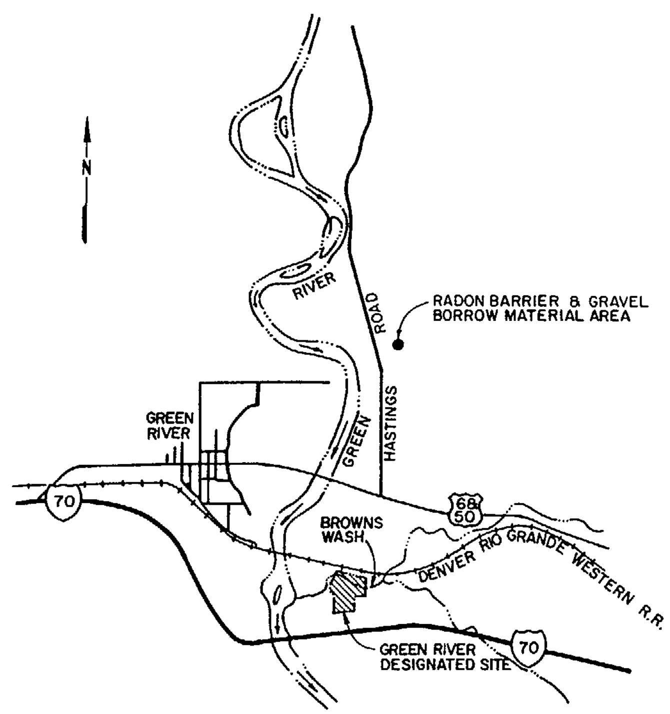
- STATE BOUNDARY
- (191) U.S. HIGHWAY
- (70) INTERSTATE
- RAILROAD

LOCATION MAP

10 0 10 20 30
SCALE MILES

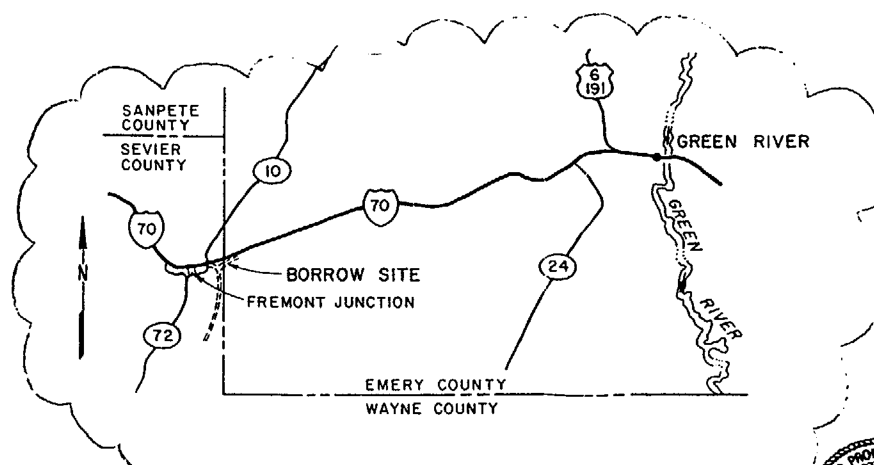
LIST OF DRAWINGS

DRAWING NO.	DRAWING TITLE
GRN-PS-10-0501	TITLE SHEET
GRN-PS-10-0502	LOCATION MAP, VICINITY MAP AND LIST OF DRAWINGS
GRN-PS-10-0503	DEMOLITION, DECONTAMINATION AND TEMPORARY FENCING PLAN
GRN-PS-10-0504	FINAL SITE PLAN
GRN-PS-10-0505	CONSTRUCTION FACILITIES AND SITE DRAINAGE
GRN-PS-10-0506	EXISTING UTILITIES LOCATION PLAN
GRN-PS-10-0507	HORIZONTAL AND VERTICAL CONTROL
GRN-PS-10-0508	WASTEWATER RETENTION BASIN PLAN AND DETAILS
GRN-PS-10-0509	ACCESS CONTROL AND CONTRACTOR'S OFFICE AREAS PLAN AND DETAILS
GRN-PS-10-0510 ✓	MISCELLANEOUS SECTIONS AND DETAILS
GRN-PS-10-0511	CONTAMINATED MATERIAL EXCAVATION PLAN (SHEET 1 OF 2)
GRN-PS-10-0512	CONTAMINATED MATERIAL EXCAVATION PLAN (SHEET 2 OF 2)
GRN-PS-10-0513	CONTAMINATED MATERIAL EXCAVATION SECTIONS & MISCELLANEOUS DETAILS
GRN-PS-10-0514	TAILINGS EMBANKMENT FOUNDATION EXCAVATION PLAN
GRN-PS-10-0515	TAILINGS EMBANKMENT FOUNDATION SECTIONS
GRN-PS-10-0516	TAILINGS EMBANKMENT AND FINAL SITE GRADING PLAN
GRN-PS-10-0517	TAILINGS EMBANKMENT AND FINAL SITE GRADING SECTIONS AND DETAILS
GRN-PS-10-0518	MONITOR WELL ABANDONMENT AND BORING LOCATION PLAN



VICINITY MAP

2000 0 2000 4000 6000 8000
SCALE FEET



△1

RIPRAP BORROW SITE MAP

10 0 10 20
SCALE MILES

SI
APERTURE
CARD

Also Available On
Aperture Card

9001040091-02

REGISTERED PROFESSIONAL ENGINEER
No. 7346
PATRICK M. GRIFFIN
STATE OF UTAH

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	△								
	△								
	△								
BC 9-2-88	△1	9-2-88	ADDED RIPRAP BORROW SITE MAP	CCR		EF	JLA		
1/29/88	△0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

FIGURE 4.9

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED / DRAWN E.C.G.
CHECKED
INSPECTED
RECOMMENDED

GREEN RIVER SITE
GREEN RIVER, UTAH

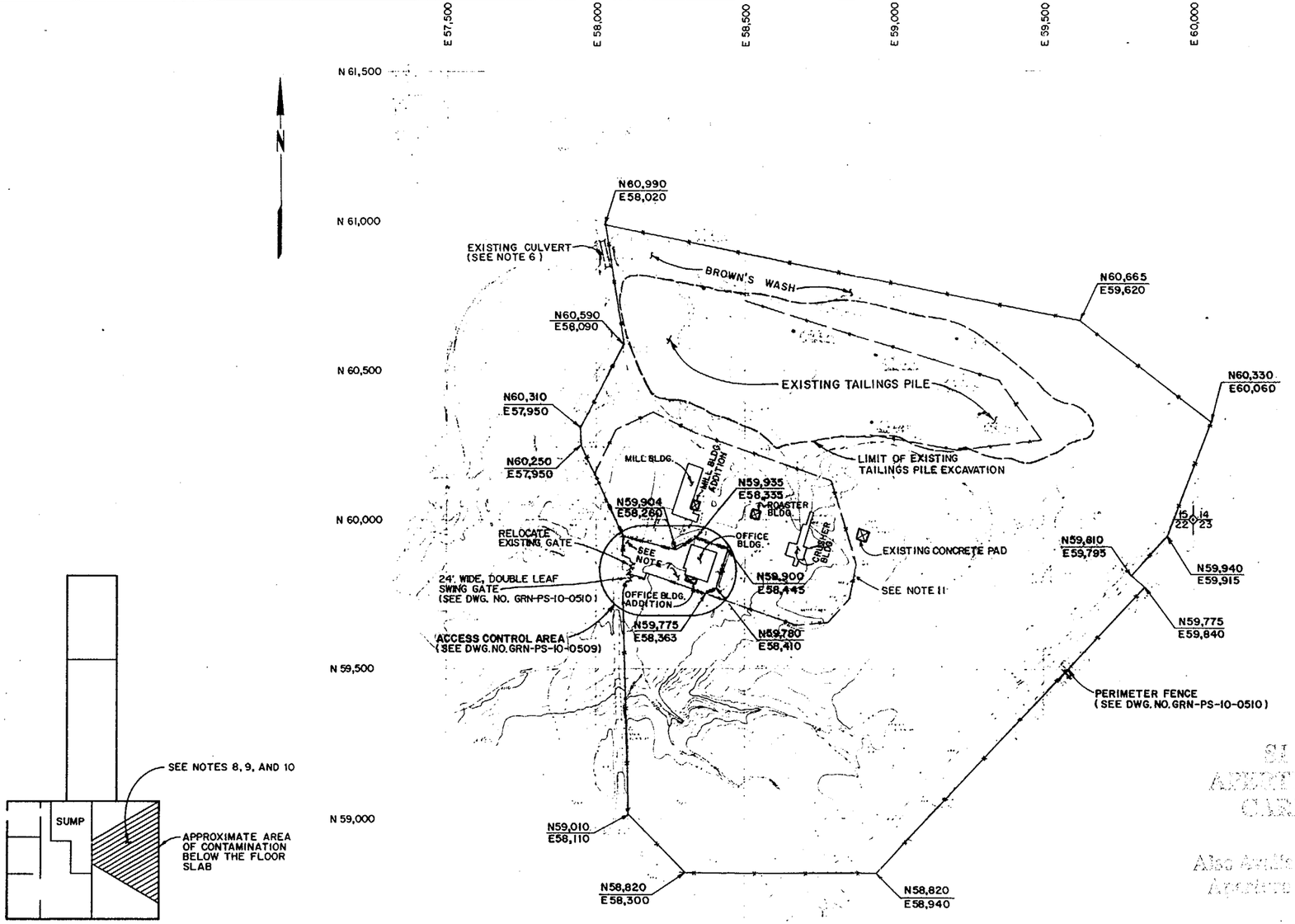
LOCATION MAP, VICINITY MAP AND LIST OF DRAWINGS

APPROVED | DATE 1-28-88 | DOE PROJECT ENGINEER | DATE 2/1/88

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. GRN-PS-10-0502 REV 1



CRUSHER BUILDING
NOT TO SCALE

200 0 200 400
SCALE FEET

NOTES:

1. SUBCONTRACTOR SHALL REMOVE EXISTING FENCES AS SHOWN AT THE BEGINNING OF CONSTRUCTION.
2. EXISTING CHAIN LINK FENCE MAY BE REUSED AS PERIMETER FENCE.
3. PERIMETER FENCE SHALL BE REMOVED ONLY AFTER COMPLETION OF ALL SUBCONTRACT WORK.
4. EXISTING BUILDINGS AND OTHER MISCELLANEOUS STRUCTURES SHALL BE DEMOLISHED BY THE SUBCONTRACTOR AS SHOWN. BUILDINGS AND OTHER STRUCTURES TO BE SAVED SHALL BE DECONTAMINATED AS SPECIFIED.
5. SUBCONTRACTOR SHALL PROTECT EXISTING STRUCTURES TO BE SAVED DURING DEMOLITION.
6. SUBCONTRACTOR SHALL CLEAR EXISTING CULVERTS AND AREA OF BROWN'S WASH 300 FEET UPSTREAM AND 100 FEET DOWN-STREAM OF VEGETATION AND DEBRIS.
7. AREA ENCLOSED BY CHAIN LINK FENCE SHOWN SHALL BE DECONTAMINATED, INCLUDING EXCAVATION OF CONTAMINATED MATERIALS, PRIOR TO USE OF OFFICE BUILDING FOR CONSTRUCTION OFFICE FACILITIES.
8. APPROXIMATE AREA OF CONTAMINATED MATERIAL BELOW FLOOR SLAB IN THE CRUSHER BUILDING IS AS SHOWN. ACTUAL AREA OF CONTAMINATION WILL BE DETERMINED IN THE FIELD.
9. ESTIMATED DEPTH OF CONTAMINATED MATERIAL EXCAVATION IS 18" BELOW FLOOR SLAB. THE FLOOR SLAB IS ESTIMATED TO BE 3 TO 4 FEET THICK
10. FOLLOWING REMOVAL OF CONTAMINATED MATERIAL, ALL DISTURBED FLOOR AREAS SHALL BE RESTORED TO ORIGINAL CONDITIONS
11. SUBCONTRACTOR SHALL COMPLETE DEMOLITION AND DECONTAMINATION OF ALL STRUCTURES AND CLEAN UP OF ALL CONTAMINATED MATERIALS WITHIN THE BOUNDARY OF THE EXISTING FENCE WITHIN 120 DAYS OF RECEIPT OF NOTICE-TO-PROCEED.
12. POINT SOURCE OF CONTAMINATION WITHIN THE OFFICE BUILDING CONCRETE FLOOR SLAB SHALL BE DECONTAMINATED.

REFERENCE DRAWINGS:

GRN-PS-10-0509	ACCESS CONTROL AND CONTRACTOR'S OFFICE AREAS PLANS AND DETAILS
GRN-PS-10-0510	MISCELLANEOUS SECTIONS AND DETAILS

LEGEND:

- 4140 — EXISTING SITE FEATURES & CONTOURS (JULY 1982 SURVEY)
- N61,500 — CONSTRUCTION GRID COORDINATE
- EXISTING FENCE TO BE SAVED
- CHAIN LINK FENCE TO BE INSTALLED
- WOVEN WIRE PERIMETER FENCE TO BE INSTALLED
- EXISTING FENCE TO BE DEMOLISHED
- EXISTING STRUCTURES & BUILDINGS TO BE DEMOLISHED
- EXISTING STRUCTURES & BUILDINGS TO BE DECONTAMINATED & SAVED

SE APERTURE CARD

Also Available On Aperture Card

900104009I-03

QA REVIEWED FOR QUALITY REQUIREMENTS
BY [signature] 1/29/88

REGISTERED PROFESSIONAL ENGINEER
No. 7366
PATRICE H. GRIFFIN
STATE OF UTAH

FIGURE 4.5

NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
1	9-2-88	ADDED NOTES 9 AND 12						
0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

QA MK-F

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

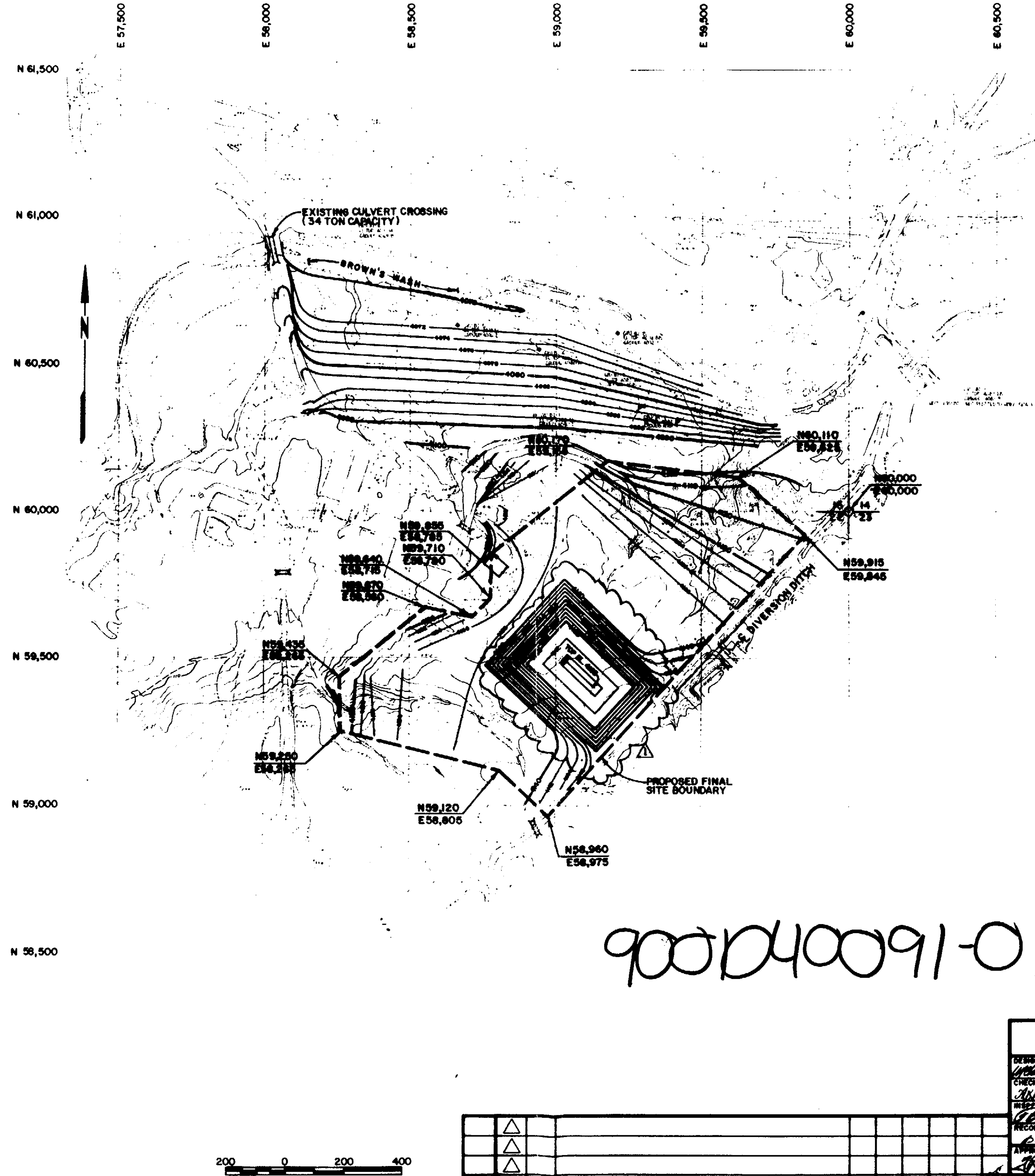
DESIGNED — DRAWN RBC
CHECKED
INSPECTED
RECOMMENDED
APPROVED — DATE 1-28-88 — DOE PROJECT ENGINEER — DATE 2/1/88

GREEN RIVER SITE
GREEN RIVER, UTAH

DEMOLITION, DECONTAMINATION AND TEMPORARY FENCING PLAN

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
100 HOWARD ST SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. GRN-PS-10-0503
REV. 1



9001040091-04

NOTES:

1. TOPOGRAPHY TAKEN FROM OLYMPUS AERIAL SURVEYS, INC., SALT LAKE CITY, UTAH (JULY 1982).

SI APERTURE CARD

Also Available On Aperture Card

REFERENCE DRAWINGS:

GRN-PS-10-0503	DEMOLITION, DECONTAMINATION AND TEMORARY FENCING PLAN
GRN-PS-10-0511	CONTAMINATED MATERIAL EXCAVATION PLAN (SHEET 1 OF 2)
GRN-PS-10-0512	CONTAMINATED MATERIAL EXCAVATION PLAN (SHEET 2 OF 2)
GRN-PS-10-0516	TAILINGS EMBANKMENT AND FINAL SITE GRADING PLAN

LEGEND:

(symbol)	EXISTING SITE FEATURES & CONTOURS (JULY 1982 SURVEY)
4080	FINAL CONTOURS
N61,500	CONSTRUCTION GRID COORDINATE
(symbol)	DRAINAGE DITCH
(symbol)	EXISTING CULVERT

REGISTERED PROFESSIONAL ENGINEER No. 7366 STATE OF UTAH

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	1	5-2-89	REVISED TAILINGS EMBANKMENT GRADING						
	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED · DRAWN RBC · CHECKED · INSPECTED · RECOMMENDED · APPROVED · DATE 1-28-88 · DOE PROJECT ENGINEER · DATE

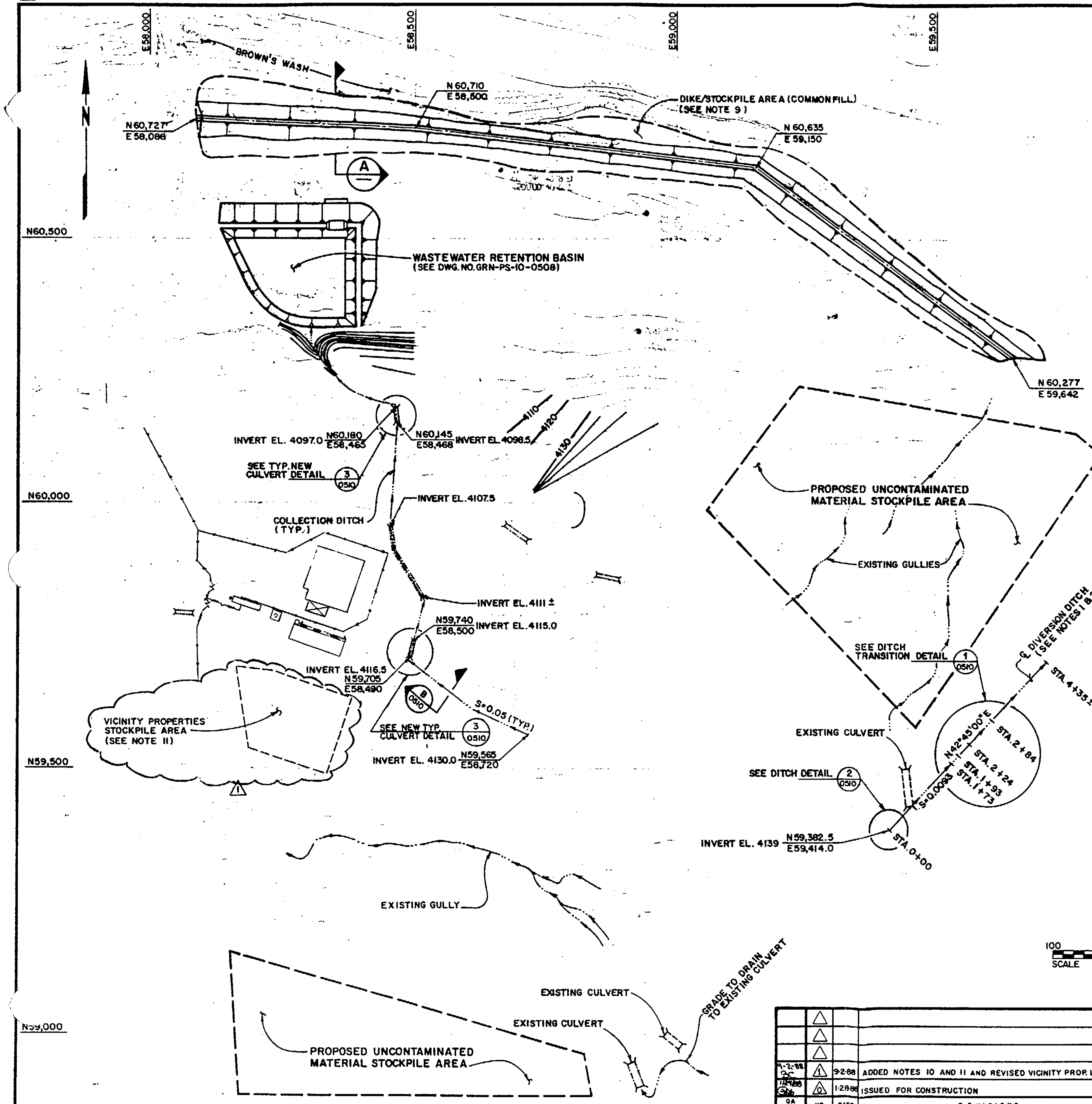
GREEN RIVER SITE
GREEN RIVER, UTAH

FINAL SITE PLAN

MORRISON-KNUDSEN ENGINEERS, INC.
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. GRN-PS-10-0504 REV. 1



NOTES:

1. BOTTOM WIDTH OF DIVERSION DITCH SECTION SHALL BE AT LEAST EIGHT FEET WIDE. SIDESLOPES OF CHANNELS SHALL NOT BE GRADED STEEPER THAN 2(H):1(V).
2. SUBCONTRACTOR SHALL TERMINATE DITCH WHEN INVERT MEETS DAYLIGHT AT DESIGN GRADE.
3. EXISTING CULVERTS SHALL BE ABANDONED OR REMOVED AS INDICATED ACCORDING TO THE SPECIFICATIONS.
4. V-DITCH SIDESLOPES SHALL NOT BE GRADED STEEPER THAN 2(H):1(V). CULVERT OUTLETS SHALL DAYLIGHT AT GRADE.
5. ALL SEDIMENTS DEPOSITED IN THE RETENTION BASIN SHALL BE EXCAVATED AND PLACED IN THE FINAL TAILINGS EMBANKMENT IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
6. THE SUBCONTRACTOR SHALL ESTABLISH THE DRAINAGE PATTERN WITHIN ALL WORK AREAS. ALL RUN-OFF FROM CONTAMINATED AREAS AT THE SITE SHALL BE DIRECTED INTO TEMPORARY DRAINAGE DITCHES AND INTO THE RETENTION BASIN.
7. SUBCONTRACTOR SHALL PROVIDE AND MAINTAIN VEHICLE CROSSING OF CONSTRUCTION DRAINAGE DITCHES.
8. SUBCONTRACTOR SHALL BE RESPONSIBLE FOR HANDLING CONTAMINATED AND UNCONTAMINATED WATER IN RETENTION BASIN AND ON SITE.
9. REMOVE CONTAMINATED MATERIAL, STOCKPILE AS SPECIFIED AND CONSTRUCT DIKE TO TOP ELEVATION OF 4081. NO COMPACTION IS REQUIRED.
10. EQUIPMENT LAYDOWN AREA SHALL BE CONSTRUCTED WITHIN AN APPROXIMATE RADIUS OF 100 FEET OF COORDINATE N59,950 AND E58,550.
11. THE VICINITY PROPERTIES STOCKPILE SHALL BE CONSTRUCTED IN THE APPROXIMATE AREA BOUNDED BY THE COORDINATES (N59,685 AND E58,165), (N59,680 AND E 58,240), (N59,635 AND E 58,385), (N59,490 AND E 58,335), (N59,535 AND E 58,190).

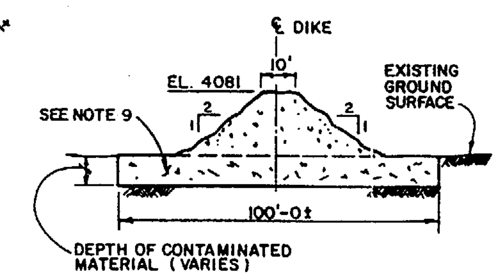
REFERENCE DRAWINGS:

GRN-PS-10-0504	FINAL SITE PLAN
GRN-PS-10-0508	WASTEWATER RETENTION BASIN PLAN AND DETAILS
GRN-PS-10-0509	ACCESS CONTROL AND CONTRACTOR'S OFFICE AREAS PLAN AND DETAILS
GRN-PS-10-0510	MISCELLANEOUS SECTIONS AND DETAILS

9001040091-05

LEGEND:

4140	EXISTING SITE FEATURES AND CONTOURS
	EXISTING CULVERT (TO BE REMOVED)
	EXISTING CULVERT (TO BE CLEANED & MAINTAINED)
	NEW CULVERT (TO BE INSTALLED)
N60,500	CONSTRUCTION GRID COORDINATE
	EMBANKMENT
	EXCAVATION



TYP. SECTION A

NOT TO SCALE

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	△								
	△								
	△								
9-2-88	1	9-2-88	ADDED NOTES 10 AND 11 AND REVISED VICINITY PROP. LOC.						
1-29-88	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED | DRAWN RBC | CHECKED | INSPECTED | RECOMMENDED | APPROVED | DATE 1-28-88

GREEN RIVER SITE
GREEN RIVER, UTAH

CONSTRUCTION FACILITIES AND SITE DRAINAGE

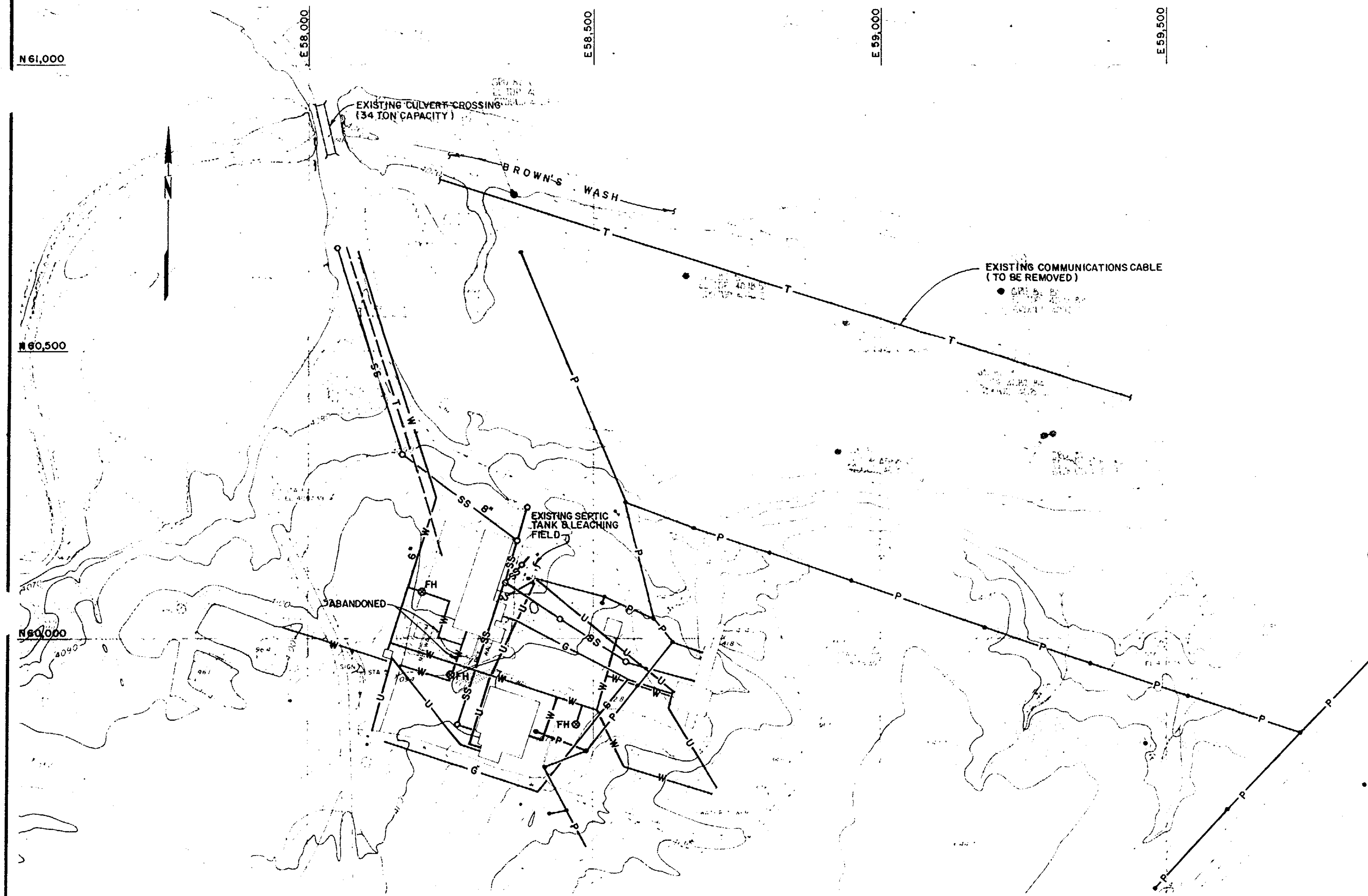
28 Jan 88
P.D. Conatore 28 Jan 88

DOE PROJECT ENGINEER | DATE 2/1/88

MORRISON-KNUDSEN ENGINEERS, INC.
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. GRN-PS-10-0505 | REV. 1



100 0 100 200
SCALE FEET

NOTES:

1. ALL LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE SUBCONTRACTOR IN THE FIELD.
2. ALL UTILITIES SHALL BE PROTECTED DURING EARTHWORK OPERATIONS UNLESS NOTED OR DIRECTED OTHERWISE BY THE CONTRACTOR. ⚠1
3. ELEVATIONS, TYPES AND SIZES OF UNDERGROUND PIPING ARE UNKNOWN UNLESS INDICATED.
4. ADDITIONAL UTILITIES NOT SHOWN MAY BE ENCOUNTERED DURING CONSTRUCTION. SUBCONTRACTOR SHALL INFORM CONTRACTOR OF ALL UNDERGROUND FACILITIES NOT SHOWN AND OBTAIN CONTRACTOR'S APPROVAL BEFORE CONTINUING WORK IN AREAS WHERE ADDITIONAL UNDERGROUND FACILITIES ARE ENCOUNTERED.

REFERENCE DRAWINGS:

9001040091-06

LEGEND:

Symbol	Meaning
——⊗ FH	FIRE HYDRANT
—— G ——	GAS LINE
POLE —•— P ——	POWER LINE
MH —o— SS ——	SANITARY SEWER AND MANHOLE
— —T— —	UNDERGROUND TELEPHONE LINE
—— W ——	WATER LINE
•	POWER POLE
—— U ——	BURIED ELECTRICAL CABLE

REGISTERED PROFESSIONAL ENGINEER No. 7346 PATRICK M. GRIFFIN STATE OF UTAH

Q.A. REVIEWED FOR QUALITY REQUIREMENTS BY [signature] 1/29/88

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	3								
	2								
A-2-88 BC	1	9-2-88	CHANGED NOTE 2	[signature]	[signature]	BJF	[signature]		[signature]
1/28/88	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

FIGURE 4.8

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

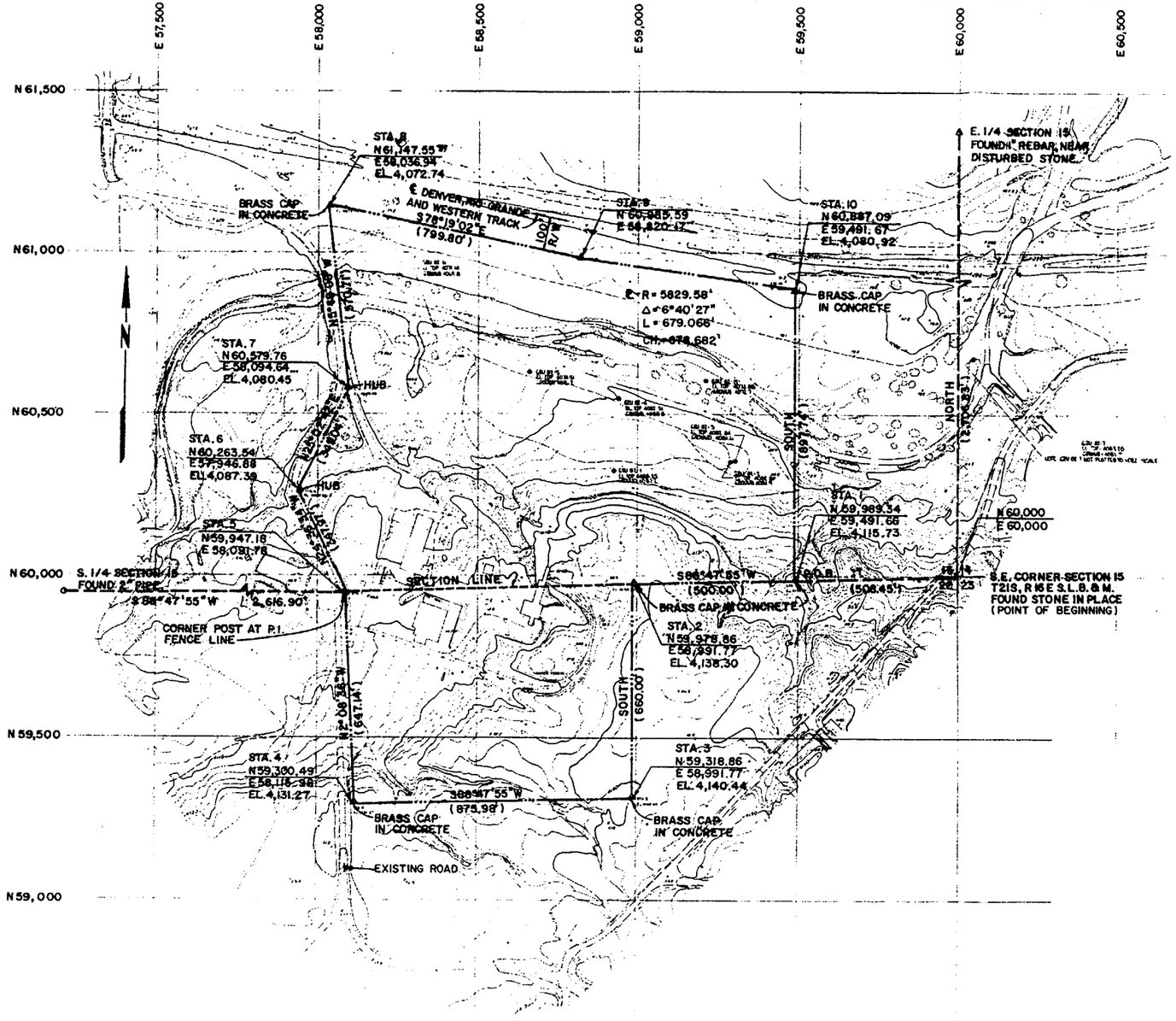
GREEN RIVER SITE
GREEN RIVER, UTAH

EXISTING UTILITIES LOCATION PLAN

DESIGNED: [signature] DRAWN: RBC
CHECKED: [signature]
INSPECTED: [signature]
RECOMMENDED: [signature]
APPROVED: [signature] DATE: 1/28/88 [signature] 28 Jan 88 R.D. Conatore 28 Jan 88
DOE PROJECT ENGINEER: [signature] DATE: 2/1/88

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. GRN-PS-10-0506 REV. 1



200 0 200 400
SCALE FEET

NOTES:

1. SURVEY DESCRIPTION:
BEGIN AT A POINT SOUTH 88°47'55" WEST 508.45 FEET ALONG THE 1/4 SECTION LINE FROM A STONE MARKING THE SOUTHEAST CORNER OF SECTION 15, TOWNSHIP 21 SOUTH, RANGE 16 EAST, SALT LAKE BASE AND MERIDIAN FROM WHICH THE EAST 1/4 CORNER OF SAID SECTION 15 IS NORTH 2,706.83 FEET AND RUNNING THENCE SOUTH 88°47'55" WEST 500.00 FEET, THENCE SOUTH 660.00 FEET, THENCE SOUTH 88°47'55" WEST 875.98 FEET, THENCE NORTH 2°08'36" WEST 647.14 FEET, THENCE NORTH 24°36'34" WEST 347.97 FEET, THENCE NORTH 25°02'42" EAST 349.04 FEET, THENCE NORTH 5°48'09" WEST 570.71 FEET TO THE SOUTHERLY RIGHT-OF-WAY LINE OF THE DENVER RIO GRANDE AND WESTERN RAILROAD, THENCE SOUTH 78°19'02" EAST 799.80 FEET ALONG SAID RIGHT-OF-WAY TO THE POINT OF TANGENCY WITH A 5,829.58 FOOT RADIUS CURVE TO THE LEFT, THENCE CONTINUING ALONG SAID RIGHT-OF-WAY AND THE ARC OF SAID CURVE 679.066 FEET, THENCE SOUTH 897.74 FEET TO THE POINT OF BEGINNING.
2. THE ORIGINAL LAND SURVEY MAP FOR THE GREEN RIVER MILL TAILINGS PROCESSING SITE WAS DEVELOPED BY WESTERN DESIGN CONSULTANTS, JULY 7, 1982.
3. THE ORIGINAL GREEN RIVER MILL TAILINGS PROCESSING SITE TOPOGRAPHIC SURVEY MAP WAS DEVELOPED BY AERIAL SURVEYS, INC., JULY 1982.

REFERENCE DRAWINGS:

LEGEND:

- 4140 — EXISTING SITE FEATURES & CONTOURS (JULY 1982 SURVEY)
- N61,500 — CONSTRUCTION GRID COORDINATE
- △ EXISTING SURVEY MONUMENT

900104 0091-07

REGISTERED PROFESSIONAL ENGINEER No. 7346 PATRICK M. GRIFFIN STATE OF UTAH

APPROVED FOR REQUIREMENTS 4/29/88

NO.	DATE	REVISIONS	BY	CK	E&D MGR	CHIEF ENG.	TAC REV.	DOE APP.
△	12886	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—
△								
△								
△								

QA MK-F 1/28/88

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED JKM | DRAWN E.C.G. | CHECKED | INSPECTED | RECOMMENDED | APPROVED

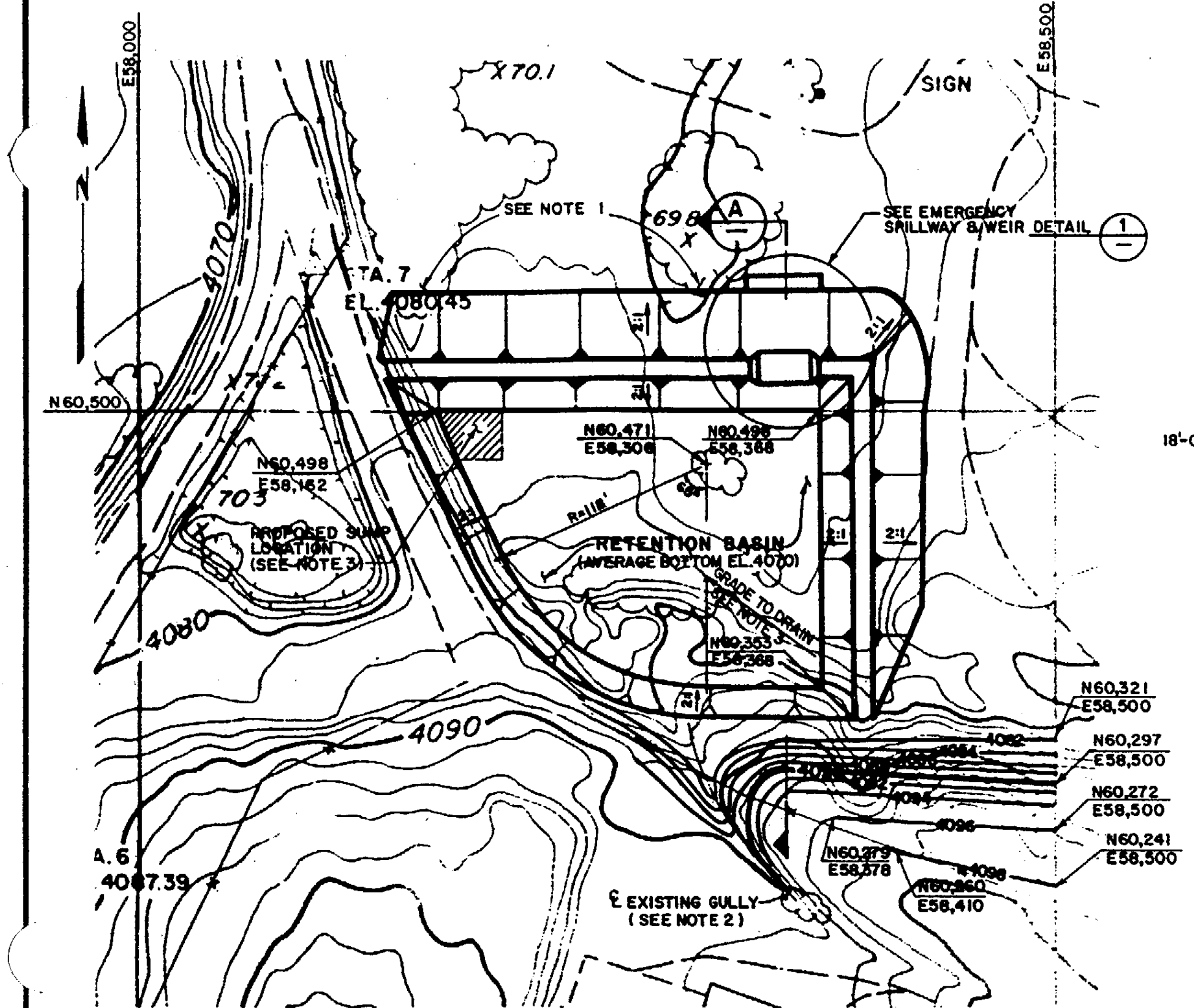
GREEN RIVER SITE
GREEN RIVER, UTAH

HORIZONTAL AND VERTICAL CONTROL

DATE 1/28/88 — DOE PROJECT ENGINEER — DATE 2/1/88

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

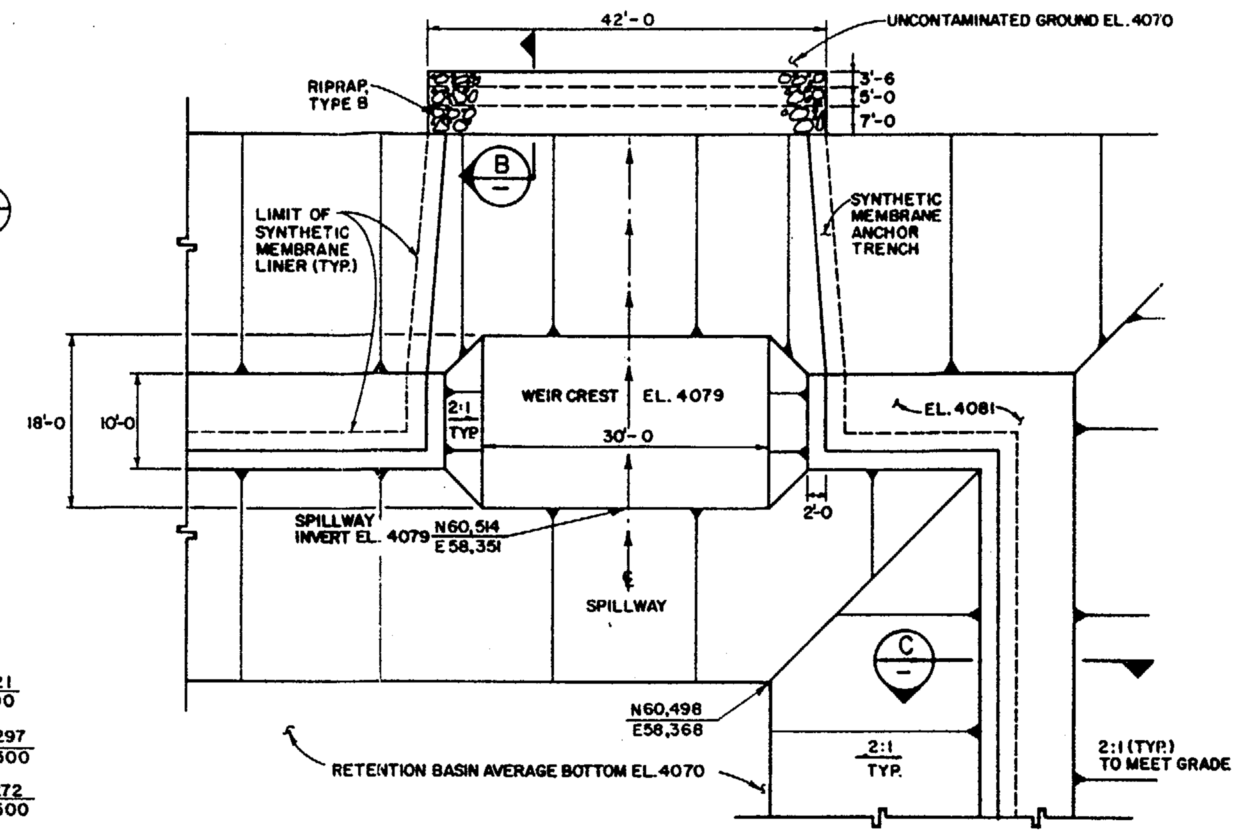
PROJECT NO. DE-AC04-83AL18796
DRAWING NO. GRN-PS-10-0507 REV. C



WASTEWATER RETENTION BASIN

(GRN-PS-10-0505)

SCALE 50 0 50 100 FEET



EMERGENCY SPILLWAY AND WEIR DETAIL 1

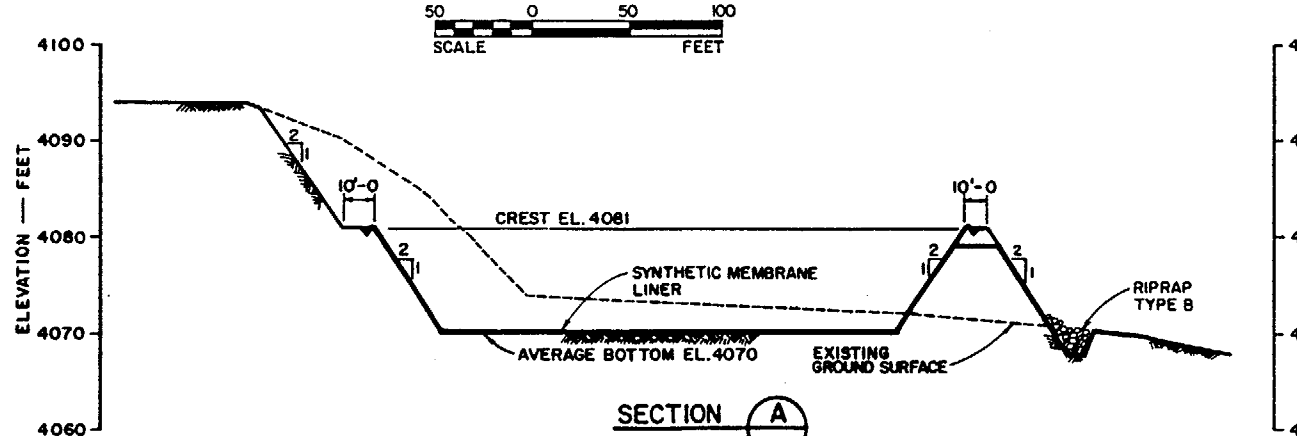
SCALE 10 0 10 20 FEET

NOTES:

1. GRADE AREA NORTH OF RETENTION BASIN TO ENSURE THAT FLOW FROM THE SPILLWAY DOES NOT RUN ALONG THE TOE OF THE RETENTION BASIN.
2. WIDEN EXISTING GULLY AS SHOWN.
3. RETENTION BASIN BOTTOM SHALL BE GRADED TO DRAIN TOWARD A SUMP AT THE NORTHWEST CORNER. SUBCONTRACTOR SHALL DESIGN SUMP FOR DEWATERING.

REFERENCE DRAWINGS:

GRN-PS-10-0505 CONSTRUCTION FACILITIES AND SITE DRAINAGE



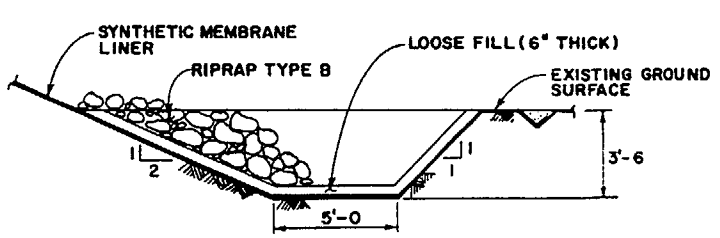
SECTION A

HORIZONTAL SCALE 30 0 30 60 FEET   VERTICAL SCALE 10 0 10 20 FEET

LEGEND:

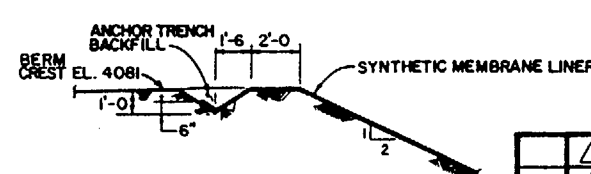
- 4070 — EXISTING SITE FEATURES AND CONTOURS (JULY 1982 SURVEY)
- 4090 — FINAL CONTOUR
- N60,500 — CONSTRUCTION GRID COORDINATE
- EMBANKMENT
- EXCAVATION
- WOVEN WIRE PERIMETER FENCE (TO BE INSTALLED)
- DRAINAGE DITCH

9001040091-08



SPILLWAY OUTLET-SECTION B

NOT TO SCALE



TYP. ANCHOR TRENCH-SECTION C

NOT TO SCALE

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	△								
	△								
	△								
	△								
1-27-88	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

QA REVIEWED FOR QUALITY REQUIREMENTS BY [signature] 1/29/88

REGISTERED PROFESSIONAL ENGINEER No. 7346 PATRICK E. GRIFFIN STATE OF UTAH

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

GREEN RIVER SITE
GREEN RIVER, UTAH

WASTEWATER RETENTION BASIN PLAN AND DETAILS

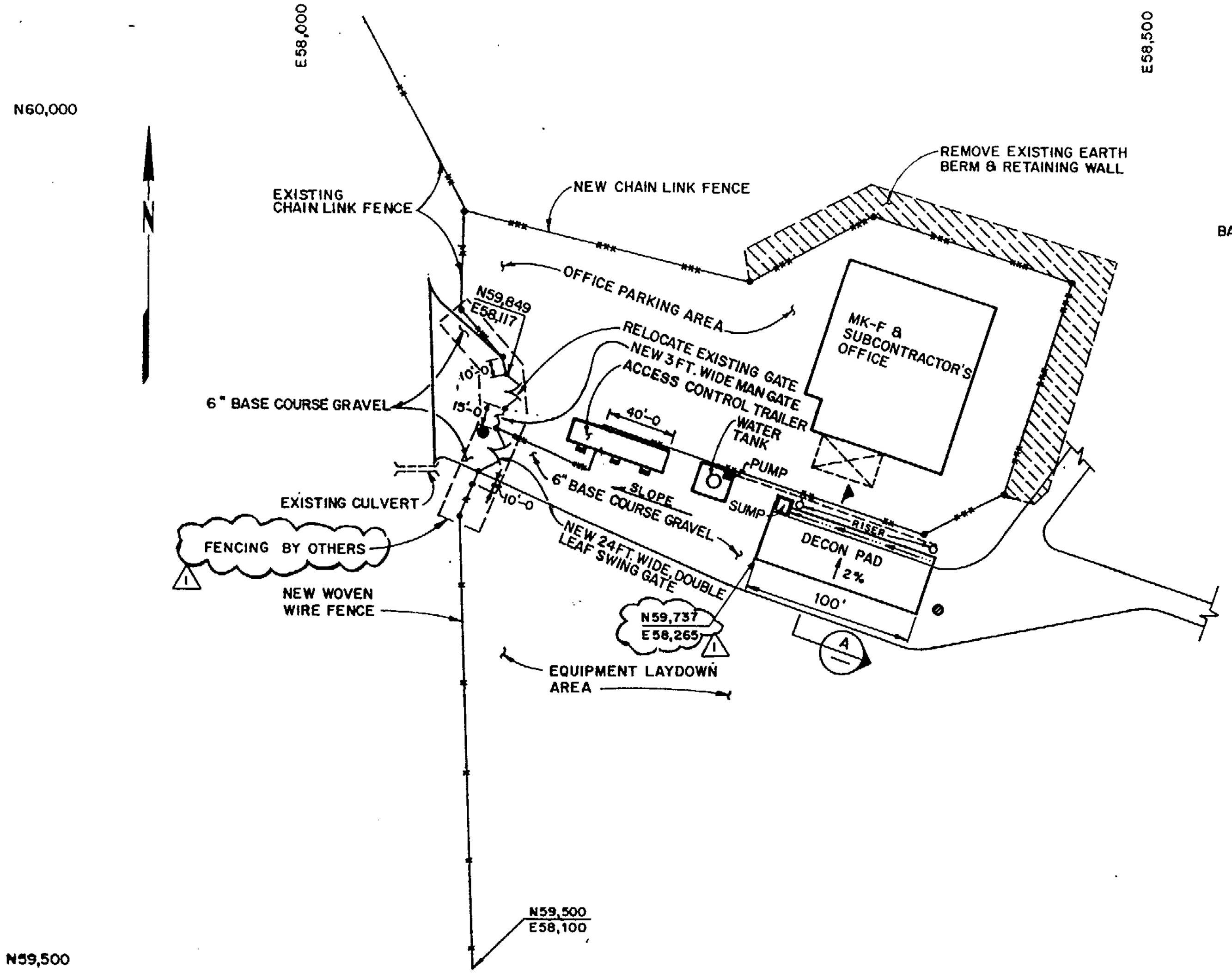
DESIGNED: [signature] | DRAWN: RBC | CHECKED: [signature] | INSPECTED: [signature] | RECOMMENDED: [signature] | APPROVED: [signature] | DATE: 1/28/88 | 28 Jan 88, 28 Jan 88 | DOE PROJECT ENGINEER: [signature] | DATE: 2/1/88

MORRISON-KNUDSEN ENGINEERS, INC.
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796

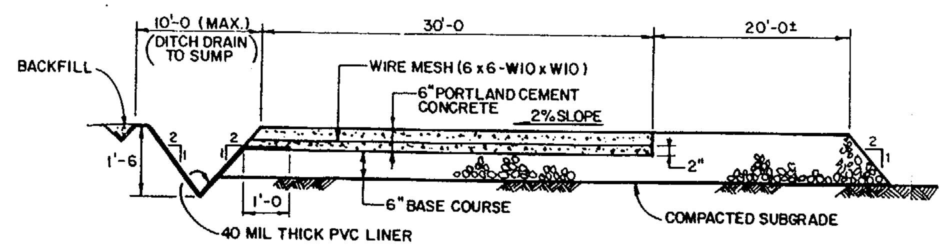
DRAWING NO. GRN-PS-10-0508

REV.



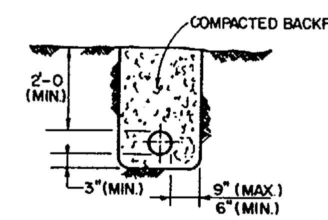
EXISTING ACCESS CONTROL AREA

(GRN-PS-10-0503)



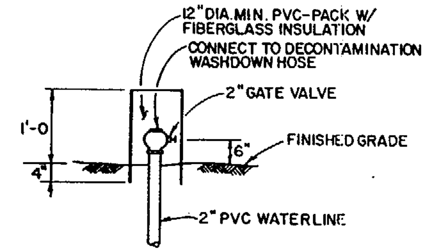
TYP. DECONTAMINATION PAD SECTION (A)

NOT TO SCALE



TYPICAL BEDDING AND BACKFILL FOR UTILITIES

NOT TO SCALE



TYPICAL STUB DETAIL

NOT TO SCALE

NOTES:

1. THE DECONTAMINATION PAD AND SUMP SHALL BE MAINTAINED BY THE SUBCONTRACTOR.
2. THE WATER TANK WILL BE REMOVED BY OTHERS PRIOR TO THE START OF CONSTRUCTION.

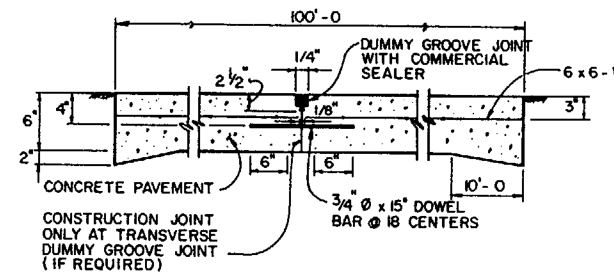
SI APERTURE CARD

Also Available On Aperture Card

REFERENCE DRAWINGS:

GRN-PS-10-0503 DEMOLITION, DECONTAMINATION AND TEMPORARY FENCING PLAN

GRN-PS-10-0510 MISCELLANEOUS SECTIONS AND DETAILS



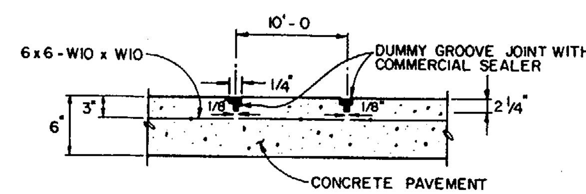
TYPICAL CONSTRUCTION JOINT DETAIL

NOT TO SCALE

LEGEND:

- REMOVE EXISTING POLE
- WOVEN WIRE FENCE
- EXISTING FENCE TO BE SAVED
- CHAIN LINK FENCE TO BE INSTALLED

900104009 1-09



TYPICAL CONTRACTION JOINT DETAIL

NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER No. 7346 PATRICK M. GRIFFIN 3 Feb 88 STATE OF UTAH

REVIEWED FOR QUALITY REQUIREMENTS 1/29/88

FIGURE 4.7

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
1-2-88 BC	1	9-2-88	CHANGED NOTE 1 AND ADDED NOTE 2, SKETCH TITLE AND FENCING BY OTHERS						
	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED | DRAWN RBC/WSO | CHECKED | INSPECTED | RECOMMENDED | APPROVED | DATE 1/28/88 | 28 Jan 88 | P.D. Conatore 28 Jan 88 | DOE PROJECT ENGINEER | DATE 2/1/88

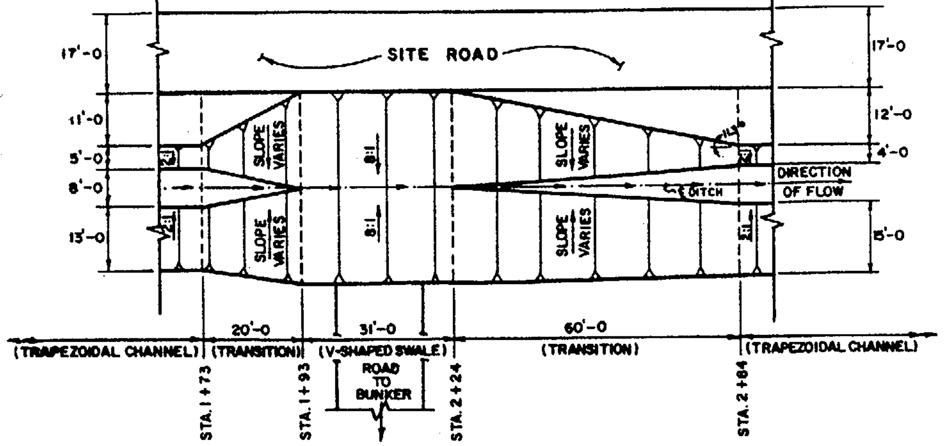
GREEN RIVER SITE
GREEN RIVER, UTAH

ACCESS CONTROL AND CONTRACTOR'S OFFICE AREAS PLAN AND DETAILS

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO CA 94105

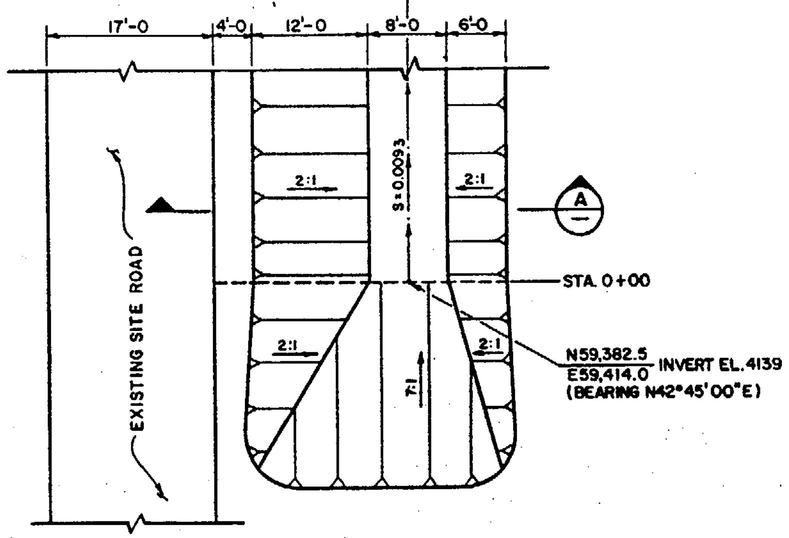
PROJECT NO. DE-AC04-83AL18796

DRAWING NO. GRN-PS-10-0509 REV. 1



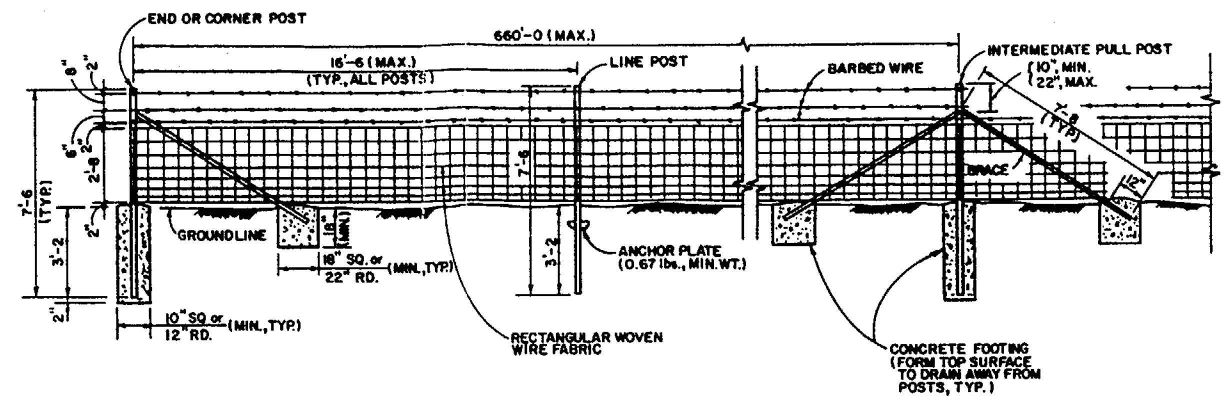
DIVERSION DITCH TRANSITION DETAIL (1 / 0505)

20 0 20 40
SCALE FEET

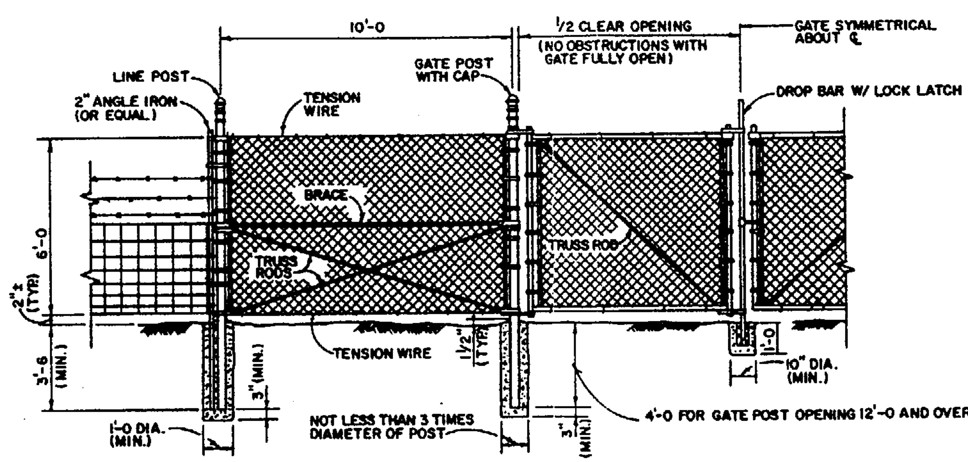


DIVERSION DITCH DETAIL (2 / 0505)

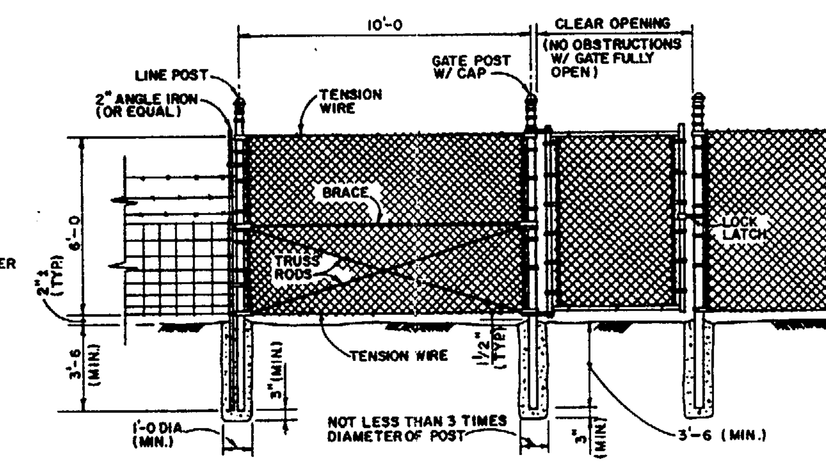
10 0 10 20
SCALE FEET



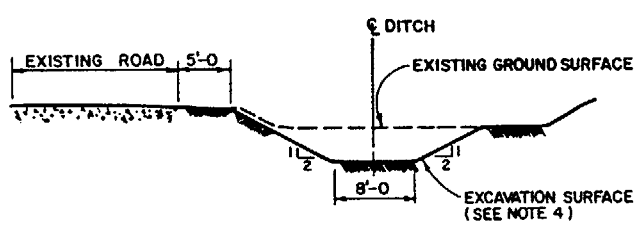
TYPICAL RECTANGULAR WOVEN WIRE FENCE ASSEMBLY
(GRN-PS-10-0503)
NOT TO SCALE



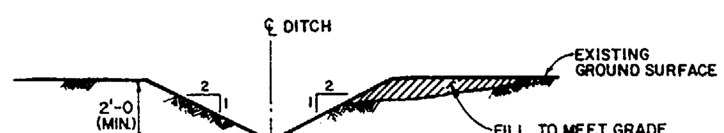
TYPICAL DOUBLE SWING GATE ASSEMBLY
(GRN-PS-10-0503)
NOT TO SCALE



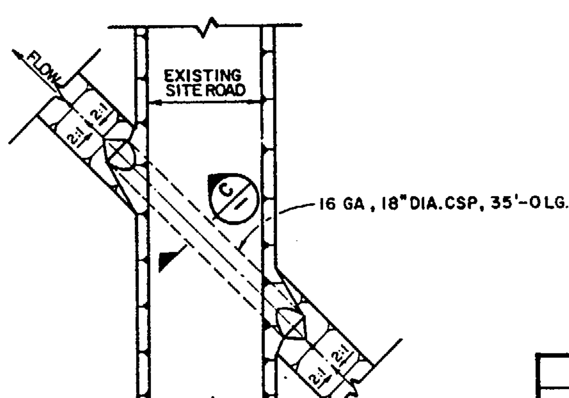
TYPICAL SINGLE SWING GATE ASSEMBLY
(GRN-PS-10-0503)
NOT TO: SCALE



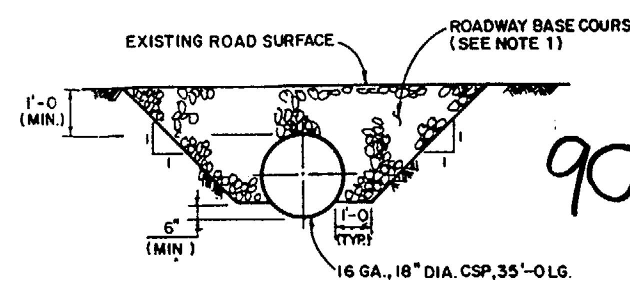
TYP. DIVERSION DITCH SECTION (A)
NOT TO SCALE



TYP. COLLECTION DITCH SECTION (B / 0505)
NOT TO SCALE



TYP. NEW CULVERT CROSSING DETAIL (3 / 0505)
NOT TO SCALE



TYP. NEW CULVERT CROSSING SECTION (C)
NOT TO SCALE

NOTES:

1. SUBCONTRACTOR SHALL FURNISH, PLACE AND COMPACT BASE COURSE FOR THE ROADWAY AT THE NEW CULVERTS.
2. SUBCONTRACTOR SHALL RECONSTRUCT ROADWAY AS NEEDED TO PRECONSTRUCTION CONDITION.
3. DRAINAGE DITCH SIDESLOPES SHALL BE GRADED NO STEEPER THAN 2 (H) : 1 (V).
4. EXCAVATION SURFACE SHOWN IS MINIMUM SIZE OF DITCH REQUIRED. MAXIMUM ADDITIONAL EXCAVATION OF ONE FOOT SHALL BE PERMITTED FOR EXCAVATION INTO ROCK.

REFERENCE DRAWINGS:

GRN-PS-10-0503	DEMOLITION, DECONTAMINATION AND TEMPORARY FENCING PLAN
GRN-PS-10-0505	CONSTRUCTION FACILITIES AND SITE DRAINAGE
GRN-PS-10-0508	WASTEWATER RETENTION BASIN PLAN AND DETAILS

LEGEND:

EMBANKMENT
EXCAVATION
DRAINAGE DITCH

REGISTERED PROFESSIONAL ENGINEER No. 7346 PATRICK M. GRIFFIN STATE OF UTAH

9001040091-10

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	△								
	△								
	△								
	△								
11/29/88	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

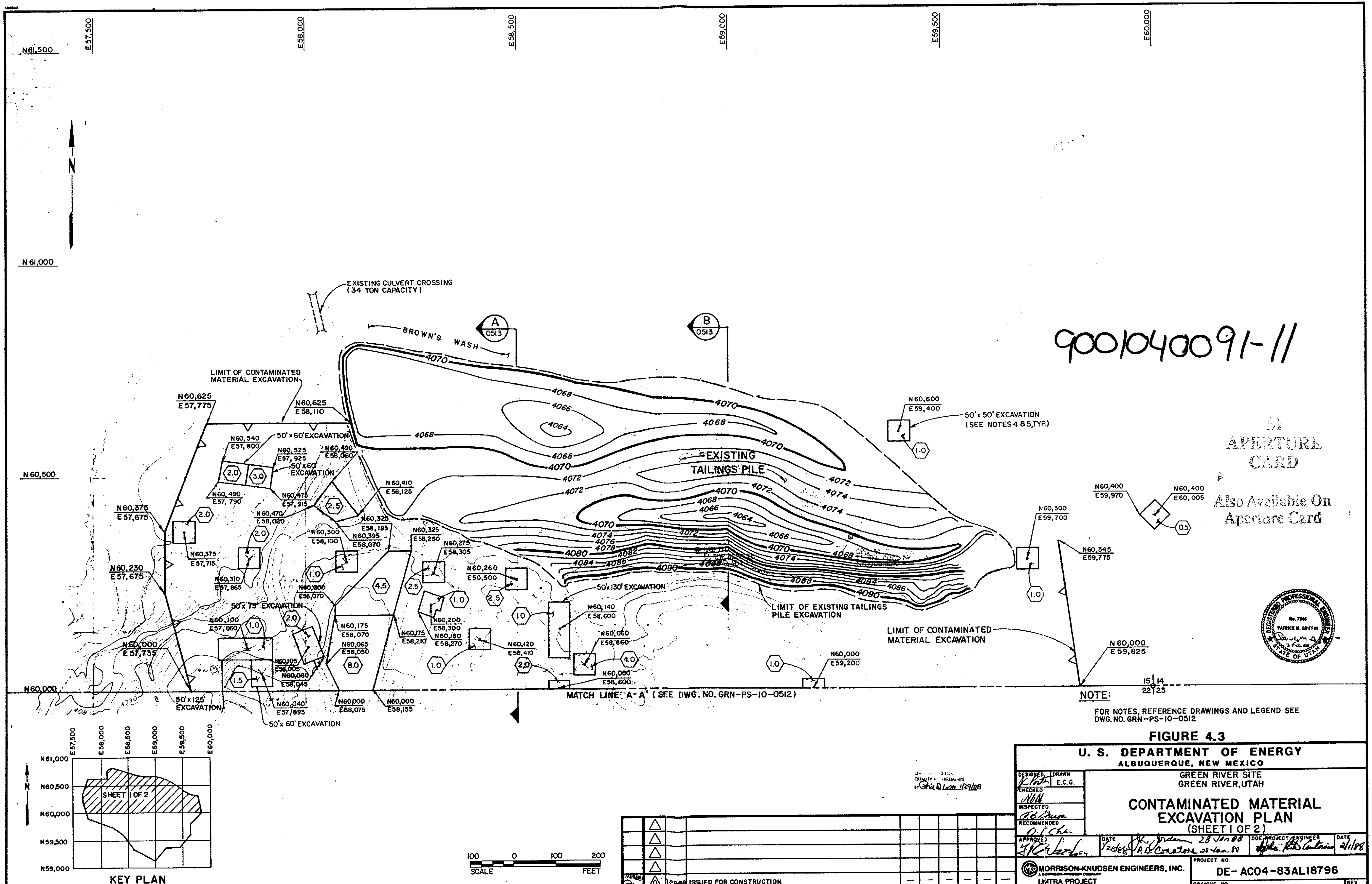
DESIGNED / DRAWN RBC
CHECKED
INSPECTED
RECOMMENDED
APPROVED
DATE 1/28/88
28 Jan 88
DOE PROJECT ENGINEER
DATE

GREEN RIVER SITE
GREEN RIVER, UTAH

MISCELLANEOUS SECTIONS AND DETAILS

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. GRN-PS-10-0510
REV. 0



NOTE:

FOR NOTES, REFERENCE DRAWINGS AND LEGEND SEE DWG. NO. GRN-PS-10-0512

FIGURE 4.3

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

GREEN RIVER SITE
GREEN RIVER, UTAH

CONTAMINATED MATERIAL EXCAVATION PLAN
(SHEET 1 OF 2)

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
1/29/88	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

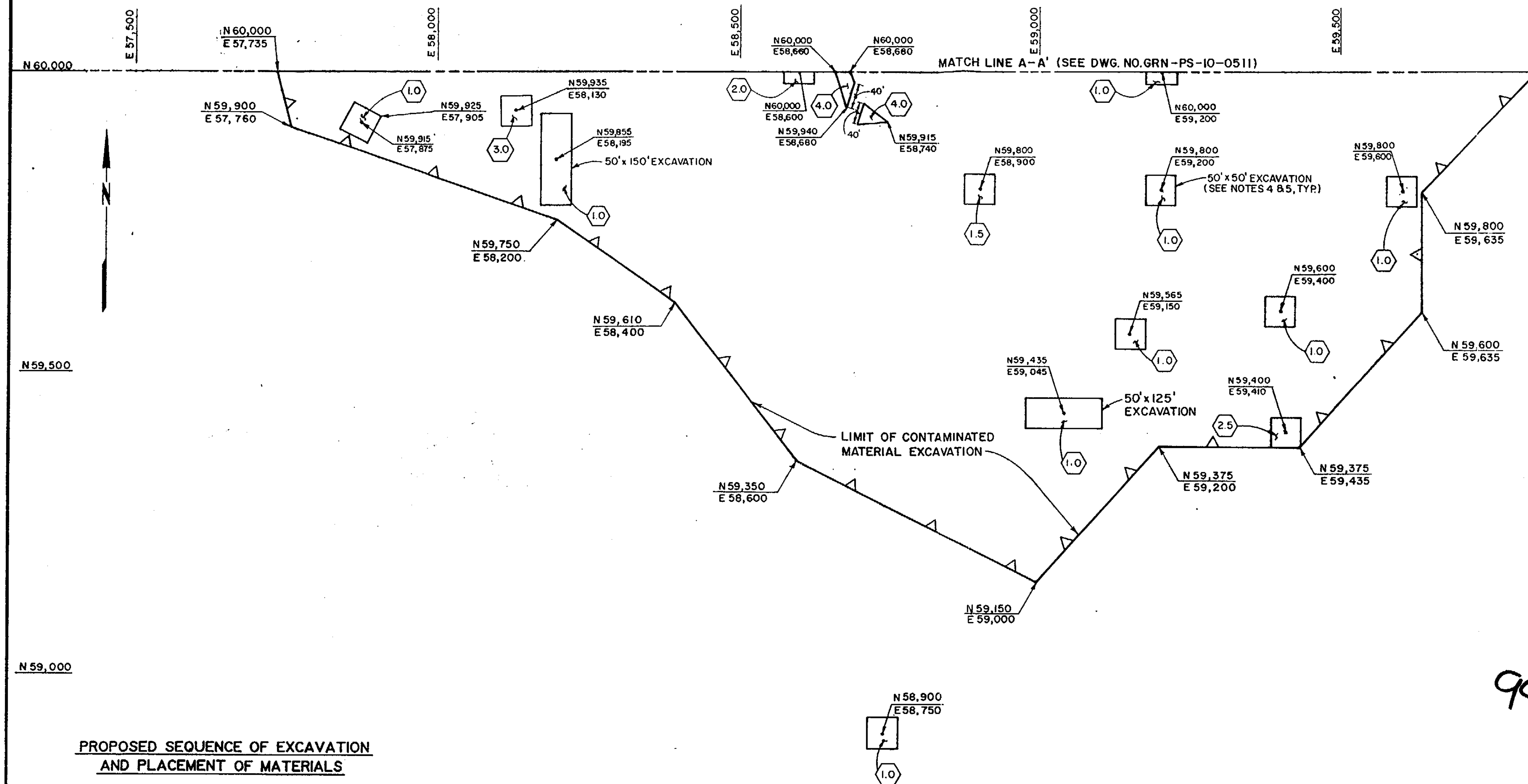
DESIGNED: K. Porter · DRAWN: E.C.G. · CHECKED · INSPECTED · RECOMMENDED · APPROVED · DATE 1/28/88 · J.K. Jordan 28 Jan 88 · P.D. Conatore 28 Jan 88 · DOE PROJECT ENGINEER · DATE 2/1/88

QA REVIEWED FOR QUALITY REQUIREMENTS BY Chris D Loth 1/29/88

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. GRN-PS-10-0511 · REV. 0



NOTES:

1. EXCAVATION SLOPE WITHIN TAILINGS PILE SHALL NOT BE STEEPER THAN 3(H):1(V).
2. ALL EXCAVATED SLOPES AND FILL SLOPES SHALL NOT BE STEEPER THAN 2(H):1(V), EXCEPT AS INDICATED.
3. FINAL LIMITS OF CONTAMINATED MATERIAL EXCAVATION IN ALL AREAS WILL BE DETERMINED BY THE CONTRACTOR.
4. ISOLATED AREAS OF EXCAVATION SHALL BE BACKFILLED WITH CLEAN FILL TO MEET THE FINAL GRADE OF THE SURROUNDING GROUND SURFACE UNLESS SHOWN OTHERWISE.
5. FINAL GROUND SURFACE IN AREAS OF CONTAMINATED MATERIAL EXCAVATION SHALL BE GRADED TO DRAIN TO PREVENT PONDING.
6. EXCAVATION WITHIN THE LIMIT OF CONTAMINATED MATERIALS SHALL BE 6-INCHES DEEP EXCEPT AS SHOWN OTHERWISE, OR AS DIRECTED BY THE CONTRACTOR.
7. THE CONTRACTOR WILL VERIFY THE NEED FOR EXCAVATION OF CONTAMINATED MATERIALS IN AREAS OF CONCRETE SURFACES. EXCAVATION SHALL NOT BE MADE IN THOSE AREAS UNLESS DIRECTED BY THE CONTRACTOR.
8. ALL EXISTING ROADWAYS DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITIONS.

REFERENCE DRAWINGS:

GRN-PS-10-0511 CONTAMINATED MATERIAL EXCAVATION PLAN (SHEET 1 OF 2)

GRN-PS-10-0513 CONTAMINATED MATERIAL EXCAVATION SECTIONS AND MISCELLANEOUS DETAILS

9001040091-12

LEGEND:

—△—	LIMIT OF CONTAMINATED MATERIAL EXCAVATION
(2.5)	⚠1 APPROXIMATE LIMIT AND DEPTH IN FEET OF CONTAMINATED MATERIAL
—4072—	APPROXIMATE CONTOURS FOR BOTTOM OF TAILINGS PILE EXCAVATION
N 60,000	CONSTRUCTION GRID COORDINATE
═ ═ ═	EXISTING ROAD

PROPOSED SEQUENCE OF EXCAVATION AND PLACEMENT OF MATERIALS

I. EXCAVATE WINDBLOWN CONTAMINATED MATERIALS FROM ACCESS CONTROL AREA, CONTRACTOR'S OFFICE AREA, RETENTION BASIN AREA, TAILINGS EMBANKMENT FOUNDATION AREA, PROPOSED UNCONTAMINATED MATERIAL STOCKPILE AREA, BROWN'S WASH DIKE AREA AND AREA WEST OF THE MILL SITE (WEST OF SITE ROAD) AND STOCKPILE EXCAVATED CONTAMINATED MATERIALS NEARBY, OR ON TOP OF EXISTING TAILINGS PILE AS APPROVED BY THE CONTRACTOR.

II. PREPARE ACCESS CONTROL AND CONTRACTOR'S OFFICE AREAS.

III. EXCAVATE THE TAILINGS EMBANKMENT FOUNDATION AS SHOWN ON DWG. NO. GRN-PS-10-0514 (TO OBTAIN MATERIAL FOR DIKE AND RETENTION BASIN CONSTRUCTION).

IV. CONSTRUCT RETENTION BASIN.

V. CONSTRUCT COLLECTION AND DIVERSION DITCHES AND DIKE (AT BROWN'S WASH).

VI. PREPARE SURFACE OF GULLY AREAS AS SPECIFIED.

VII. FILL THE GULLY AREAS WITH GRAVEL AS SHOWN ON DWG. NO. GRN-PS-10-0516.

VIII. STOCKPILE UNCONTAMINATED EXCAVATED MATERIALS FROM THE TAILINGS EMBANKMENT AT THE FILLED GULLY AREAS AS SHOWN ON DWG. NO. GRN-PS-10-0505 FOR GENERAL FINAL SITE GRADING.

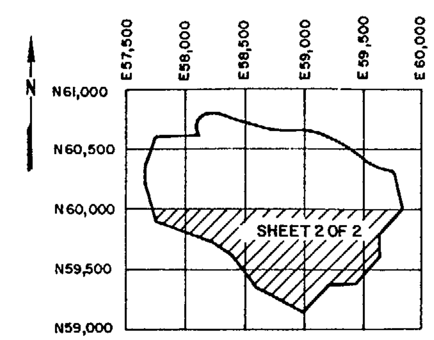
IX. START EXCAVATION OF CONTAMINATED MATERIALS FROM THE SOUTHERN END OF THE EXISTING TAILINGS PILE TOWARDS BROWN'S WASH.

X. EXCAVATE REMAINDER OF WINDBLOWN CONTAMINATED MATERIALS.

XI. CONSTRUCT TAILINGS EMBANKMENT AND PLACE VICINITY PROPERTY MATERIAL INTO THE CELL.

NOTE: ITEMS ABOVE MAY BE PERFORMED CONCURRENTLY SUBJECT TO CONTRACTOR'S APPROVAL.

100 0 100 200
SCALE FEET



KEY PLAN

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	△								
	△								
	△								
9-2-88	1	9-2-88	CHANGED LEGEND			EJF			
1-29-88	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

REVIEWED FOR QUALITY REQUIREMENTS BY Grid Access 1/29/88

REGISTERED PROFESSIONAL ENGINEER No. 7346 PATRICK H. GRIFFIN 3 Feb 88 STATE OF UTAH

FIGURE 4.4

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

GREEN RIVER SITE
GREEN RIVER, UTAH

CONTAMINATED MATERIAL EXCAVATION PLAN
(SHEET 2 OF 2)

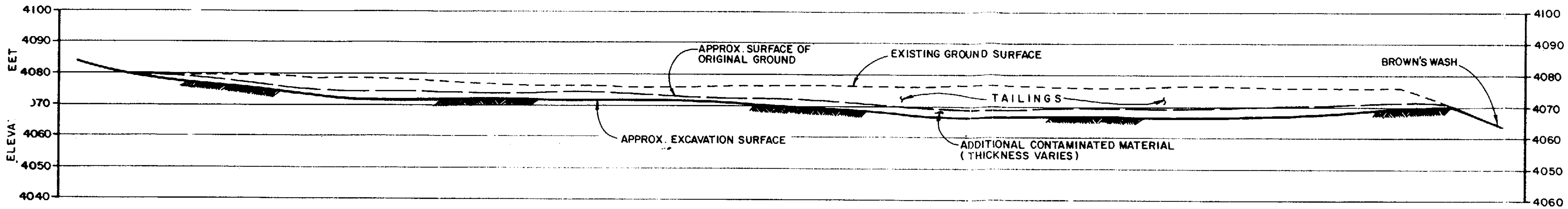
DESIGNED | DRAWN E.C.G. | CHECKED | INSPECTED | RECOMMENDED | APPROVED | DATE | 23 Jan 88 | 28 Jan 88 | DOE PROJECT ENGINEER | DATE 2/1/88

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796

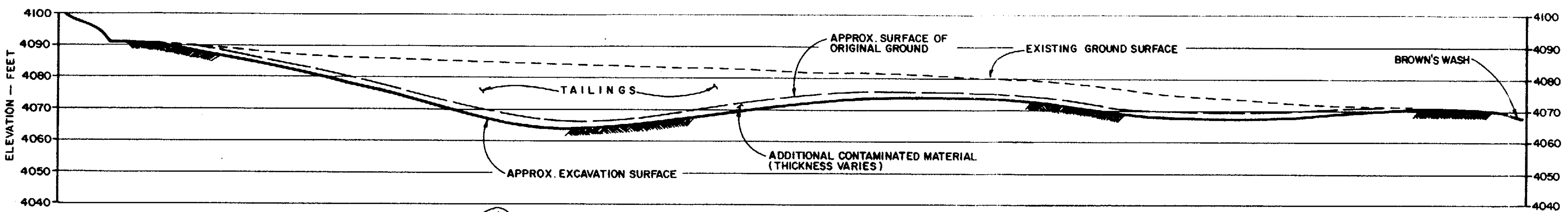
DRAWING NO. GRN-PS-10-0512 REV. 1

9001040091-13



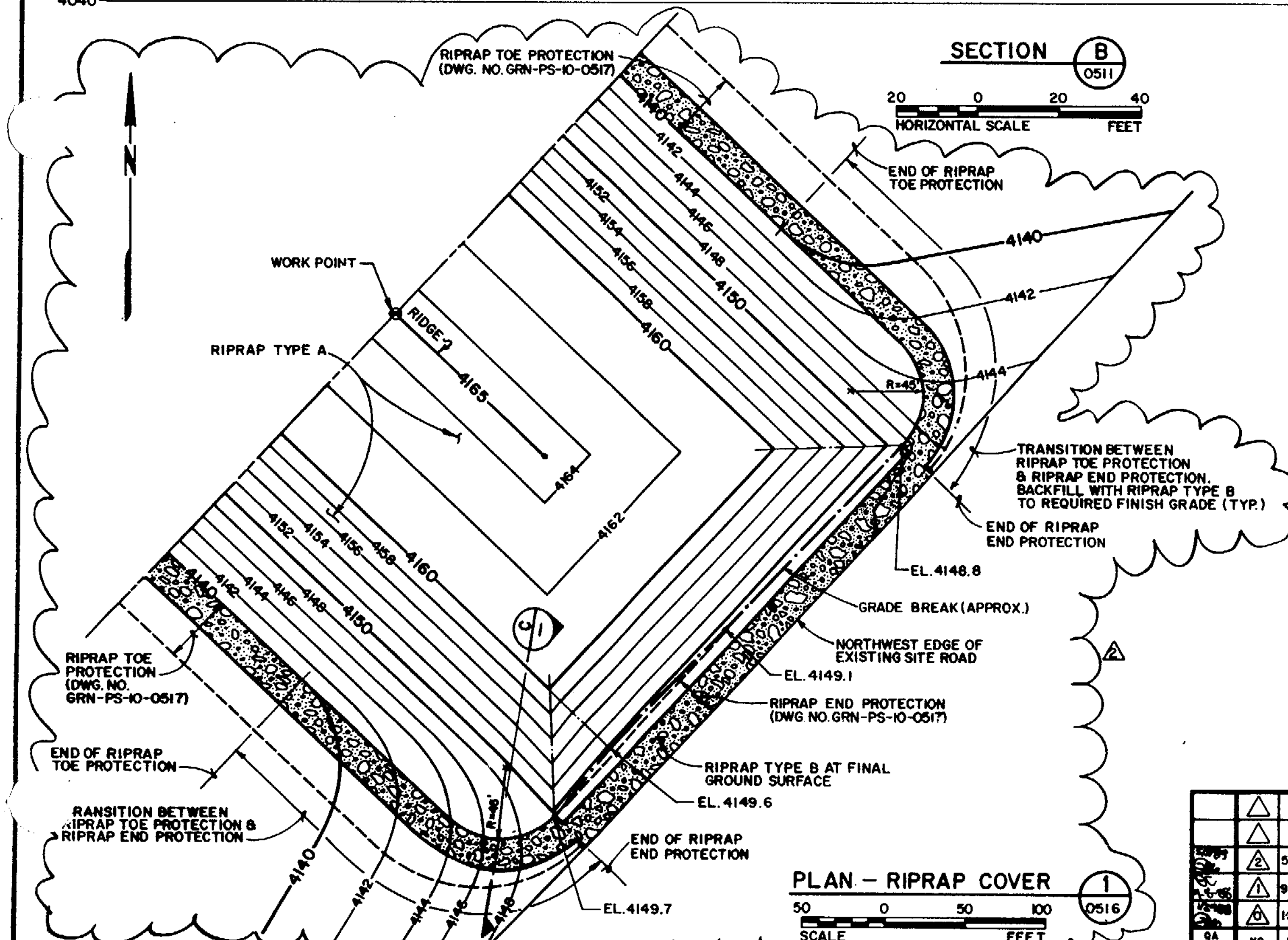
SECTION (A / 0511)

20 0 20 40
HORIZONTAL SCALE FEET



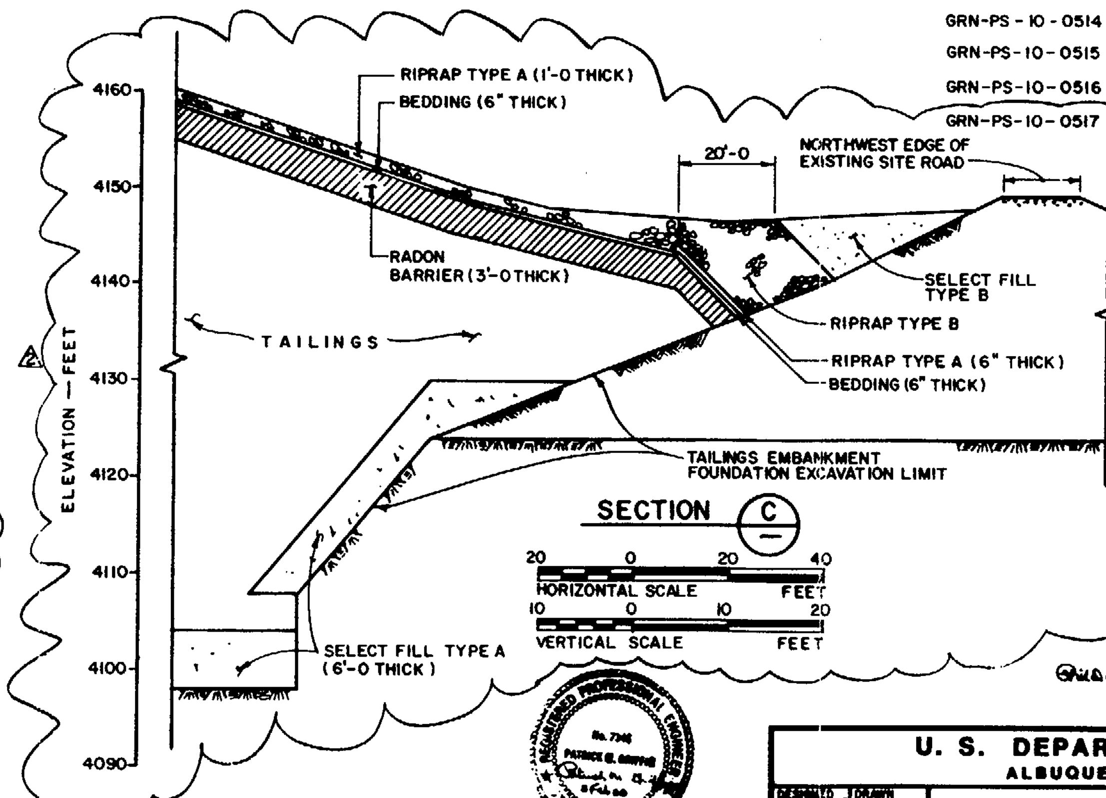
SECTION (B / 0511)

20 0 20 40
HORIZONTAL SCALE FEET



PLAN – RIPRAP COVER (1 / 0516)

50 0 50 100
SCALE FEET



SECTION (C / —)

20 0 20 40
HORIZONTAL SCALE FEET
10 0 10 20
VERTICAL SCALE FEET

REFERENCE DRAWINGS:

GRN-PS-10-0511	CONTAMINATED MATERIAL EXCAVATION PLAN (SHEET 1 OF 2)
GRN-PS-10-0512	CONTAMINATED MATERIAL EXCAVATION PLAN (SHEET 2 OF 2)
GRN-PS-10-0514	TAILINGS EMBANKMENT FOUNDATION EXCAVATION PLAN
GRN-PS-10-0515	TAILINGS EMBANKMENT FOUNDATION SECTIONS
GRN-PS-10-0516	TAILINGS EMBANKMENT & FINAL SITE GRADING PLAN
GRN-PS-10-0517	TAILINGS EMBANKMENT & FINAL SITE GRADING-SECTIONS & DETAILS

Shildcon 1/29/88

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	△								
	△								
	2	5-2-89	REVISED RIPRAP COVER AND SECTIONS						
	1	9-2-88	REVISED THICKNESS OF RADON BARRIER						
	0	12-8-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

GREEN RIVER SITE
GREEN RIVER, UTAH

CONTAMINATED MATERIAL EXCAVATION SECTIONS & MISCELLANEOUS DETAILS

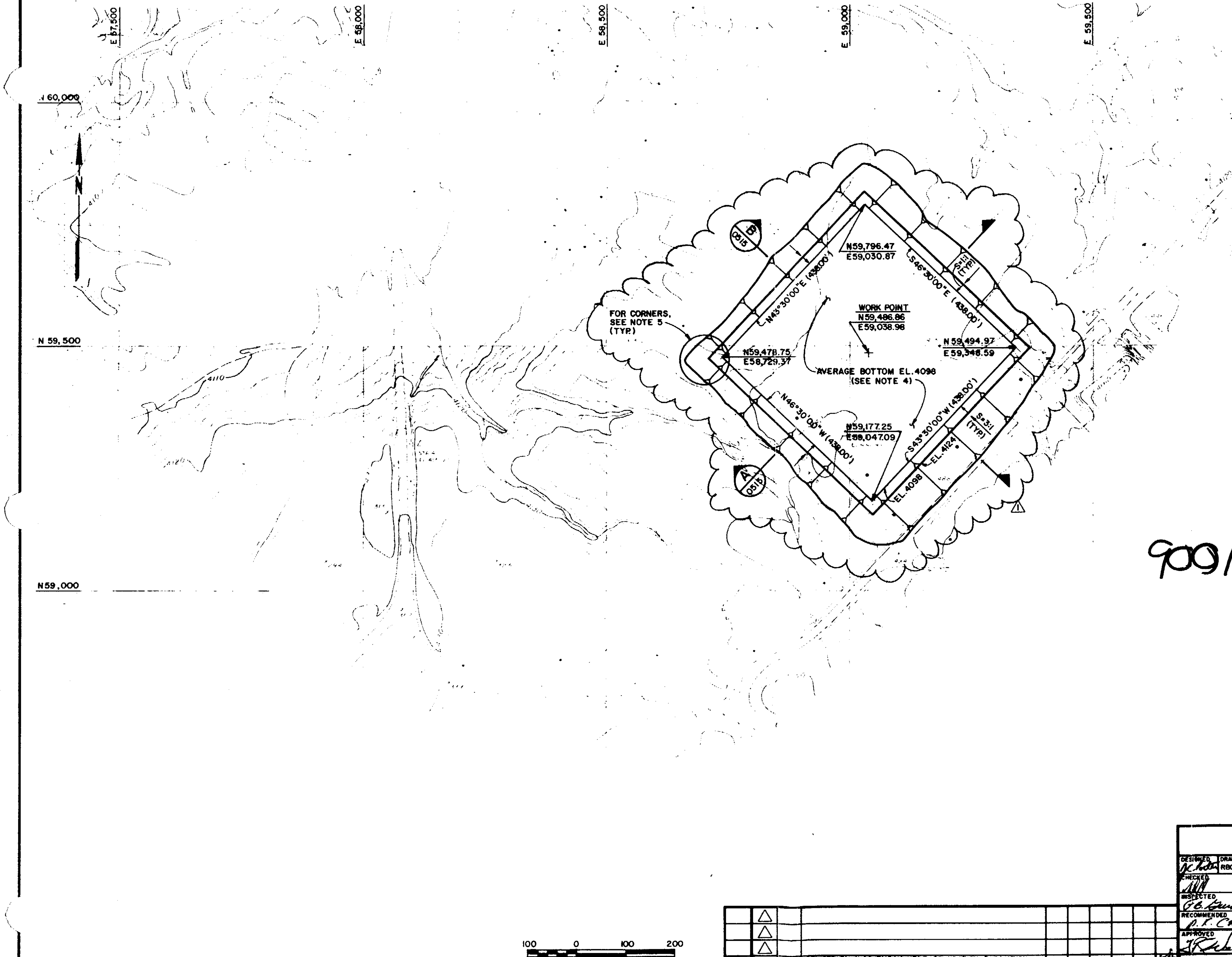
DESIGNED | DRAWN RBC | CHECKED | INSPECTED | RECOMMENDED | APPROVED | DATE | DOE PROJECT ENGINEER | DATE 2/1/88

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. GRN-PS-10-0513

REV. 2



SI APERTURE CARD

Also Available On Aperture Card

NOTES:

1. SEE DWG. NO. GRN-PS-10-0517, FOR EXCAVATED SLOPES. ⚠1
2. REMOVE EXISTING UTILITIES IN THE AREA OF EXCAVATION AS DIRECTED BY THE CONTRACTOR.
3. EQUIPMENT SHALL NOT BE OPERATED CLOSER THAN 10 FEET FROM TOP OF EXCAVATION.
4. EXCAVATION ELEVATIONS SHALL BE ACHIEVED TO TOLERANCES PRACTICABLE, AS APPROVED BY THE CONTRACTOR. THE CONTRACTOR WILL MONITOR EXCAVATION TO DETERMINE ACHIEVABLE TOLERANCES.
5. CORNERS OF EXCAVATION SHALL BE ROUNDED AS DIRECTED BY THE CONTRACTOR.

⚠1

REFERENCE DRAWINGS:

GRN - PS - 10 - 0515 TAILINGS EMBANKMENT FOUNDATION SECTIONS

9091040091-14

LEGEND:

4120	EXISTING SITE FEATURES & CONTOURS (JULY 1982 SURVEY)
N60,000	CONSTRUCTION GRID COORDINATE ⚠1
•	UTILITY POLE
‾Y‾‾Y‾	EXCAVATION

QA REVIEWED FOR QUALITY REQUIREMENTS BY [signature] 1/29/88

REGISTERED PROFESSIONAL ENGINEER No. 7346 PATRICK M. GRIFFIN [signature] 3 Feb 88 STATE OF UTAH

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	△								
	△								
	△								
[initials] 5/2/89	1	5-2-89	REVISED TAILINGS EMBANKMENT FOUNDATION EXCAVATION. DELETED NOTE 6 & EXCAVATION CONTOUR ON LEGEND.	[initials]	[initials]	[initials]	[initials]		[initials]
[initials] 1/27/88	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

GREEN RIVER SITE
GREEN RIVER, UTAH

TAILINGS EMBANKMENT FOUNDATION EXCAVATION PLAN

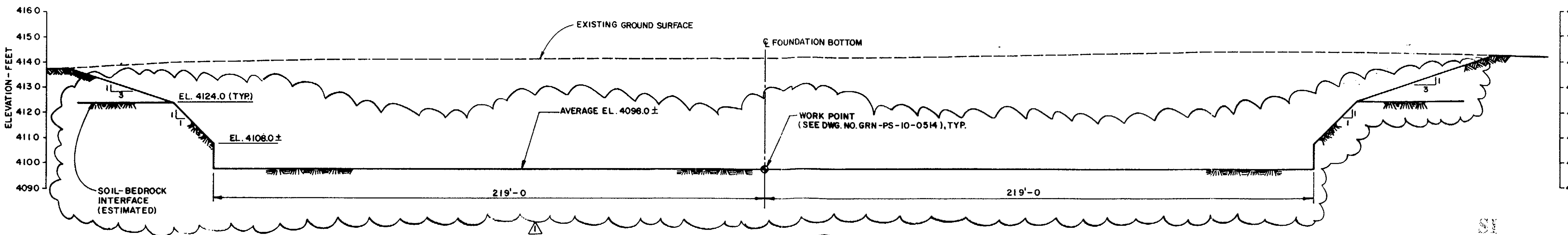
DESIGNED	[signature]
DRAWN	RBC
CHECKED	[signature]
INSPECTED	G.B. Guro
RECOMMENDED	P. K. Chen
APPROVED	[signature]
DATE	1/25/88
	J. Jordan 28 Jan 88; P. D. Constone 28 Jan 88
DOE PROJECT ENGINEER	[signature]
DATE	2/1/88

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796

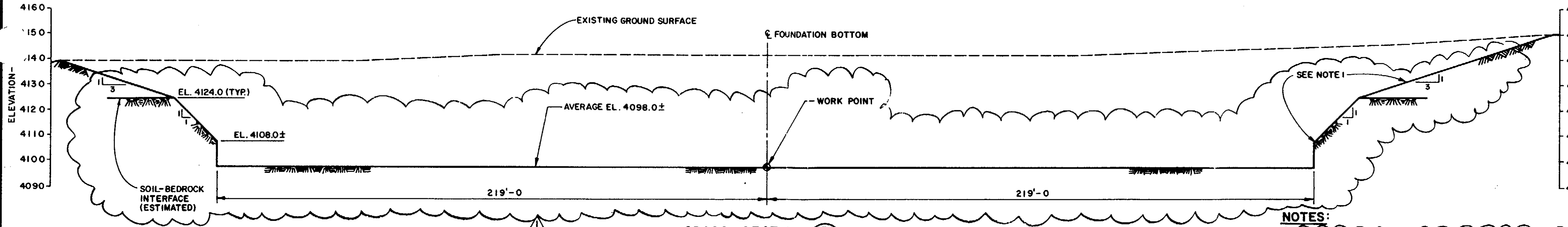
DRAWING NO. GRN-PS-10-0514

REV. 1



CROSS-SECTION A (0514)

20 0 20 40
SCALE FEET



CROSS-SECTION B (0514)

20 0 20 40
SCALE FEET

9001040091-15

NOTES:

1. EXCAVATION BEYOND THE LIMITS SHOWN, ON THIS SIDE ONLY, SHALL BE PERMITTED TO PROVIDE AN ACCESS RAMP, AS APPROVED BY THE CONTRACTOR.

REFERENCE DRAWINGS:

GRN-PS-10-0514 TAILINGS EMBANKMENT FOUNDATION EXCAVATION PLAN

REGISTERED PROFESSIONAL ENGINEER No. 7344 PATRICK M. GRIFFIN STATE OF UTAH 3 Feb 89

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	1	5-2-89	REVISED TAILINGS EMBANKMENT EXCAVATION SURFACE						
1/21/88	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED: | DRAWN: BH | CHECKED: | INSPECTED: | RECOMMENDED: | APPROVED: | DATE: 1/28/88 | DOE PROJECT ENGINEER | DATE: 2/1/88

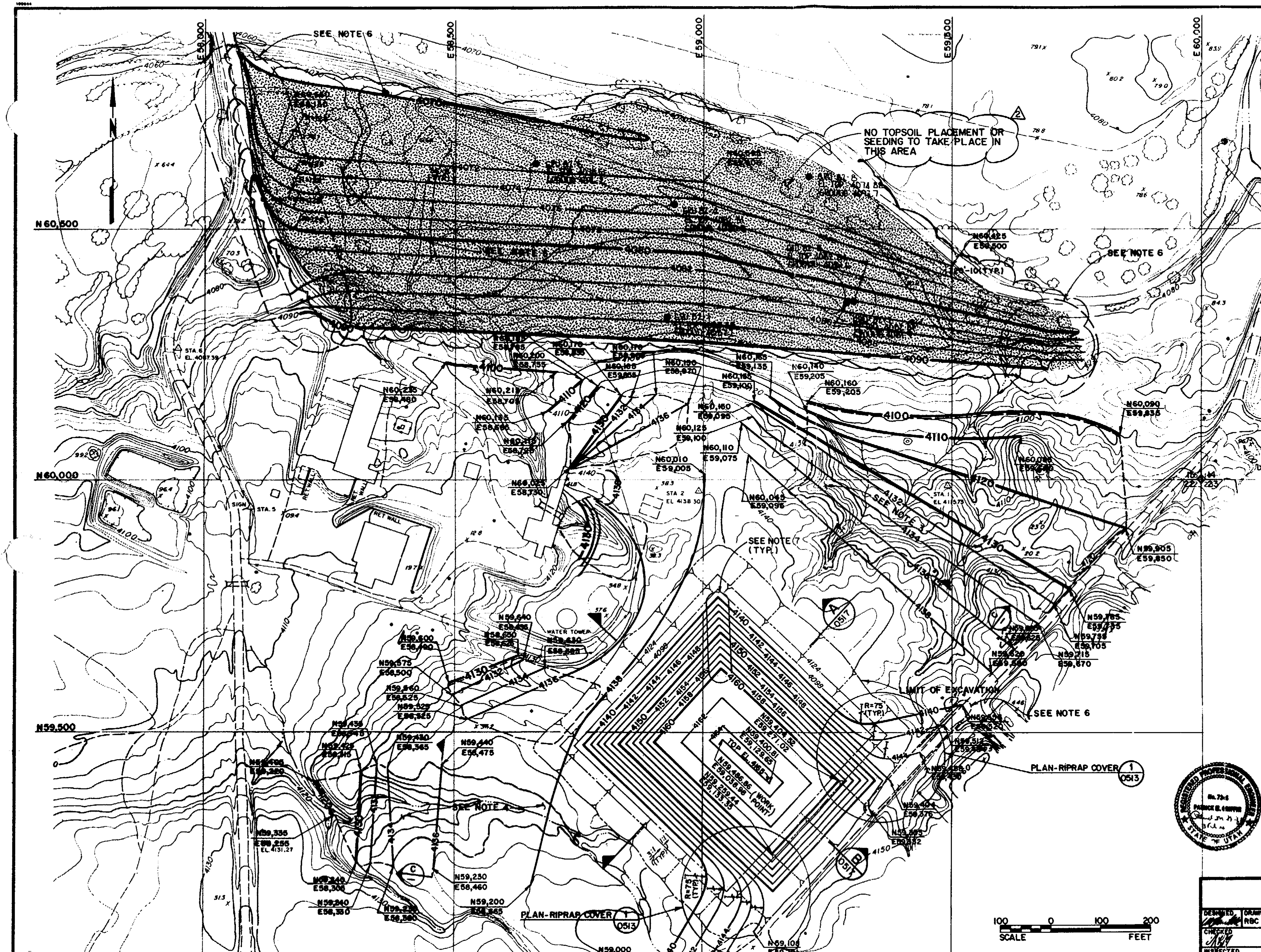
GREEN RIVER SITE
GREEN RIVER, UTAH

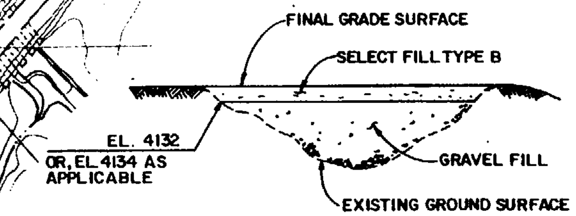
TAILINGS EMBANKMENT FOUNDATION SECTIONS

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796

DRAWING NO. GRN-PS-10-0515 REV. 1





TYPICAL SECTION C

NOT TO SCALE

9001040091-16

NOTES:

1. FOR SEQUENCE OF EXCAVATION AND PLACEMENT OF MATERIALS SEE DWG. NO. GRN-PS-10-0512.
2. FINAL EMBANKMENT TOP SLOPE ELEVATIONS SHALL BE ADJUSTED TO ACCOMMODATE ACTUAL QUANTITIES OF CONTAMINATED MATERIALS.
3. MAXIMUM ELEVATION OF GRAVEL FILL IN THIS AREA SHALL BE 4132 FT.
4. MAXIMUM ELEVATION OF GRAVEL FILL IN THIS AREA SHALL BE 4134 FT.
5. FINAL GROUND SURFACE ELEVATIONS IN THIS AREA SHALL BE DETERMINED BY THE CONTRACTOR BASED ON FINAL GROUND SURFACE ELEVATIONS FOLLOWING EXCAVATION OF CONTAMINATED MATERIAL AND ACTUAL QUANTITIES OF EXCAVATED UNCONTAMINATED MATERIAL.
6. FINAL GRADING CONTOURS SHALL CONFORM TO EXISTING CONTOURS IN THIS AREA.
7. ALL EMBANKMENT CORNERS SHALL BE ROUNDED AS DIRECTED BY THE CONTRACTOR.

REFERENCE DRAWINGS:

GRN-PS-10-0512	CONTAMINATED MATERIAL EXCAVATION PLAN (SHEET 2 OF 2)
GRN-PS-10-0517	TAILINGS EMBANKMENT & FINAL SITE GRADING SECTIONS AND DETAILS

LEGEND:

4150	EXISTING SITE FEATURES & CONTOURS (JULY 1982 SURVEY)
4160	FINAL CONTOURS
N60,500	CONSTRUCTION GRID COORDINATE
— — —	GRAVEL FILL AREAS
⊐ ⊏	EXISTING CULVERT
—·—·—	TAILINGS EMBANKMENT EXCAVATION

REGISTERED PROFESSIONAL ENGINEER No. 7316 PATRICK B. GRIFFIN STATE OF UTAH

QA REVIEWED FOR QUALITY REQUIREMENTS BY [signature] 1/29/88

QA MK-F	NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
	2	6-27-89	OUTLINED 13 ACRE AREA OF COMMON FILL WITHOUT TOPSOIL OR SEEDING	FGS	PRC	[signature]			[signature]
	1	5-2-89	REVISED TAILINGS EMBANKMENT GRADING & ADDED LEGEND	FGS	PRC	FJF	BWJ		[signature]
	0	1-28-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED [signature] DRAWN RBC
CHECKED [signature]
INSPECTED [signature]
RECOMMENDED [signature]
APPROVED [signature] DATE 1/28/88 [signature] 28 Jan 88 R.D. Constone 28 Jan 88
DOE PROJECT ENGINEER [signature] DATE 2/1/88

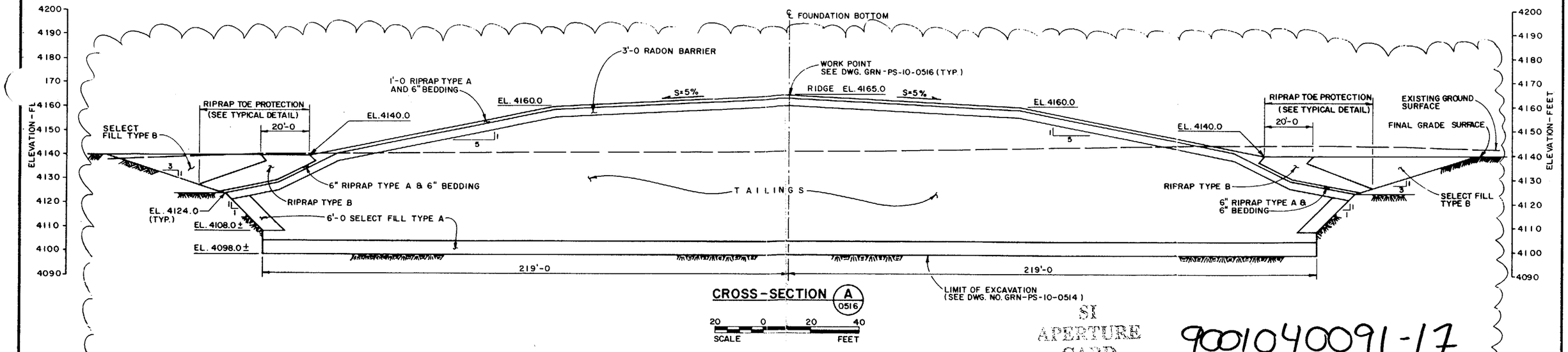
GREEN RIVER SITE
GREEN RIVER, UTAH

TAILINGS EMBANKMENT AND FINAL SITE GRADING PLAN

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

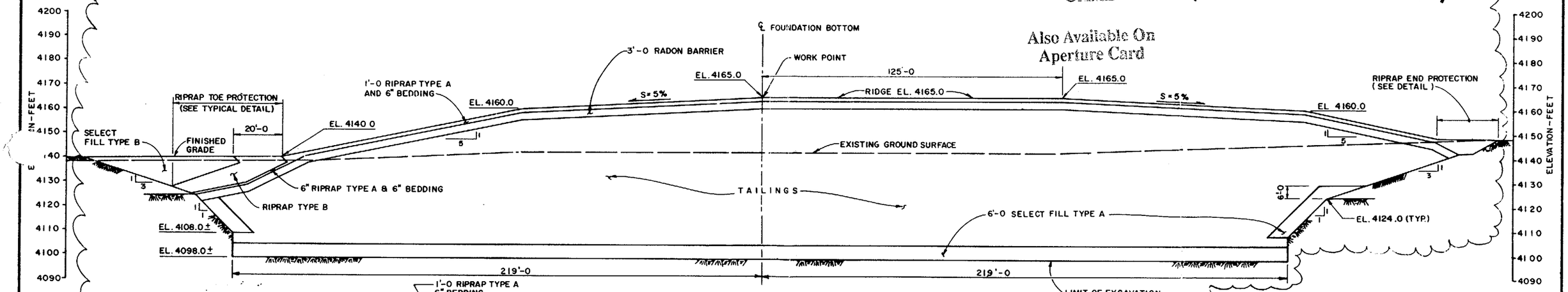
PROJECT NO. DE-AC04-83AL18796

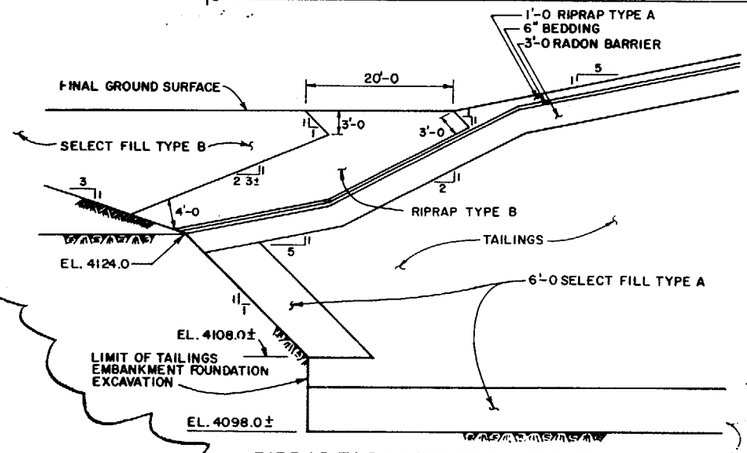
DRAWING NO. GRN-PS-10-0516 REV. 2



CROSS-SECTION A 0516

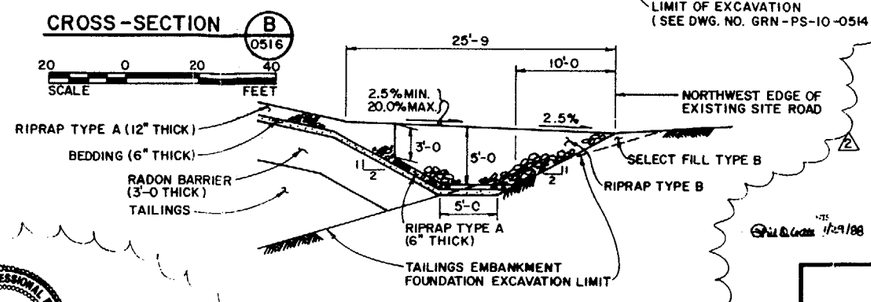
SCALE 20 0 20 40 FEET





RIPRAP TOE PROTECTION DETAIL

SCALE 10 0 10 FEET



RIPRAP END PROTECTION DETAIL

NOT TO SCALE

NOTES:

1. FINAL RADON BARRIER LAYER THICKNESS SHALL BE DETERMINED BY THE CONTRACTOR.
2. INTERSECTION OF TOP SLOPE AND SIDE SLOPE SHALL BE APPROXIMATELY AS SHOWN.
3. FINAL TAILINGS EMBANKMENT ELEVATIONS WILL BE DETERMINED BY THE CONTRACTOR.

REFERENCE DRAWINGS:

GRN-PS-10-0514 TAILINGS EMBANKMENT FOUNDATION EXCAVATION PLAN
GRN-PS-10-0516 TAILINGS EMBANKMENT & FINAL SITE GRADING PLAN

NO.	DATE	REVISIONS	BY	CK	E&D MGR.	CHIEF ENG.	TAC REV.	DOE APP.
2	5-2-89	REVISED CROSS-SECTION A & B AND RIPRAP PROTECTION DET.	FBG					
1	9-2-88	REVISED THICKNESS OF RADON BARRIER	CEL					
0	12-8-88	ISSUED FOR CONSTRUCTION	—	—	—	—	—	—

QA MK-F

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DESIGNED DRAWN RBC
CHECKED
INSPECTED
RECOMMENDED
APPROVED DATE 1/20/88 DOE PROJECT ENGINEER DATE 2/1/88

GREEN RIVER SITE
GREEN RIVER, UTAH

TAILINGS EMBANKMENT AND FINAL SITE GRADING SECTIONS AND DETAILS

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON-KNUDSEN COMPANY
UMTRA PROJECT
180 HOWARD ST. SAN FRANCISCO, CA 94105

PROJECT NO. DE-AC04-83AL18796
DRAWING NO. GRN-PS-10-0517 REV. 2